FINAL
ENVIRONMENTAL ASSESSMENT

PROPOSED RUNWAY SAFETY AREA PROGRAM
San Francisco International Airport
San Francisco, San Mateo County, California

Prepared for:

CITY AND COUNTY OF SAN FRANCISCO
SAN FRANCISCO AIRPORT COMMISSION

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
As lead Federal Agency pursuant to the National Environmental Policy Act of 1969

Prepared by:

URS Corporation

November 2011

This environmental assessment becomes a Federal document when evaluated, signed and dated by the Responsible FAA Official.

Responsible FAA Official

12/05/2011
Date

GENERAL INFORMATION ABOUT THIS DOCUMENT

WHAT'S IN THIS DOCUMENT? This document contains a Final Environmental Assessment (EA) for the City and County of San Francisco's (CCSF) proposed Runway Safety Area Program, which involves both runway complexes at San Francisco International Airport (SFO or the Airport). This document discloses the analysis and findings of the potential impacts of the City and County of San Francisco's Proposed Action, the No Action and other reasonable alternatives.

BACKGROUND. *The Transportation, Treasury, Housing and Urban Development, The Judiciary, The District of Columbia, and Independent Agencies Appropriations Act, 2006* (Public Law 109-115), requires completion of Runway Safety Area improvements by airports in the United States that hold a certificate issued by the FAA under Title 49 of the Unites States Code, Section 44706 to meet FAA design standards for Runway Safety Areas required by Title 14, Code of Federal Regulations, Part 139 by December 31, 2015. The City and County of San Francisco, as owner and operator of San Francisco International Airport, has developed its proposed action to meet the requirements of Public Law 109-115.

SFO staff and FAA staff conducted project briefings to regulatory agencies at the Interagency Meeting in October 2010. Between October and November 2010, SFO and the consultant team conducted briefings to local cities and regulatory agencies to introduce the proposed project, purpose and need of the project, potential alternatives, environmental resource categories, to provide an overview of the EA process. The Draft EA was released on June 24, 2011. The notice of availability of the Draft EA, public workshop, and public hearing were advertised in three local newspapers to inform the general public and other interested parties. A public workshop and public hearing was conducted on July 28, 2011 at the Millbrae City Hall.

The document presented herein represent the Final EA for the federal decision-making process, in fulfillment of FAA's policies and procedures relative to NEPA and other related federal requirements. Copies of the document are available for inspection at various libraries in the San Francisco Bay Area, San Francisco International Airport, FAA Western-Pacific Region Office in Hawthorne, and the FAA San Francisco Airports District Office in Brisbane. The addresses for these locations are provided in Chapter 5.0 of this Final EA.

WHAT SHOULD YOU DO? Read the Final Environmental Assessment to understand the actions that CCSF and FAA intend to take relative to the proposed Runway Safety Area Program at SFO.

WHAT HAPPENS AFTER THIS? The FAA will decide to prepare and issue a Finding of No Significant Impact/Record of Decision (FONSI/ROD) or decide to prepare an Environmental Impact Statement.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WESTERN-PACIFIC REGION

FINDING OF NO SIGNIFICANT IMPACT
AND
RECORD OF DECISION

ly Safety Area Improvement Program

ancisco International Airport
co, San Mateo County, California

For further information

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December 9, 2011

GENERAL INFORMATION ABOUT THIS DOCUMENT

WHAT'S IN THIS DOCUMENT? This document is the Federal Aviation Administration's (FAA) Finding of No Significant Impact (FONSI) and Record of Decision (ROD) for the proposed Runway Safety Area Improvement Program at San Francisco International Airport located in San Mateo County, California. This document includes the agency determinations and approvals for those proposed Federal actions described in the Final Environmental Assessment dated December 2011. This document discusses all alternatives considered by FAA in reaching its decision, summarizes the analysis used to evaluate the alternatives, and briefly summarizes the potential environmental consequences of the Proposed Action and the No Action alternative, which are evaluated in detail in this FONSI and ROD. This document also identifies the environmentally preferred alternative and the agency preferred alternative. This document identifies applicable and required mitigation.

BACKGROUND. In June 2011, the City and County of San Francisco prepared a Draft Environmental Assessment (DEA). The DEA addressed the potential environmental effects of the proposed Runway Safety Area Improvement Program including various reasonable alternatives to that proposal. The DEA was prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) [Public Law 91-190, 42 USC 4321-4347], the implementing regulations of the Council on Environmental Quality (CEQ) [40 CFR Parts 1500-1508], and FAA Orders 1050.1E, *Environmental Impacts: Policies and Procedures* and 5050.4B, *National Environmental Policy Act (NEPA), Implementing Instructions for Airport Actions*. The City and County of San Francisco published the Notice of Availability for the DEA on June 24, 2011. The City and County of San Francisco received comments on the draft between June 24, 2011 and July 29, 2011. FAA approved the Final EA on December 5, 2011.

WHAT SHOULD YOU DO? Read the Finding of No Significant Impact and Record of Decision to understand the actions that FAA intends to take relative to the proposed Runway Safety Area Improvement Program at San Francisco International Airport.

WHAT HAPPENS AFTER THIS? The City and County of San Francisco may begin to implement the Proposed Action.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
FINDING OF NO SIGNIFICANT IMPACT
AND
RECORD OF DECISION

PROPOSED RUNWAY SAFETY AREA IMPROVEMENT PROGRAM

SAN FRANCISCO INTERNATIONAL AIRPORT
SAN MATEO COUNTY, CALIFORNIA

1. **Introduction.** This document is a Finding of No Significant Impact (FONSI) on the environment and Record of Decision (ROD) (FONSI/ROD) as a result of proposed Runway Safety Area Improvement Program at San Francisco International Airport (SFO), San Mateo County, California. The City and County of San Francisco (CCSF) is the sponsor for San Francisco International Airport. The Federal Aviation Administration (FAA) must comply with the National Environmental Policy Act of 1969 (NEPA) before being able to take the federal actions of approval of those portions of the Airport Layout Plan (ALP) that depict the proposed projects. Approval of the ALP is authorized by the Airport and Airway Improvement Act of 1982, as amended (Public Laws 97-248 and 100-223).

2. **Purpose and Need of the Proposed Action.** The proposed action is for the CCSF to meet FAA Airport Design Standards for the Runway Safety Areas for each of the four runways at San Francisco International Airport to the extent practicable. The San Francisco International Airport is a commercial service airport that accommodates both air carrier aircraft as well as general aviation. The existing Runway Safety Areas for all four runway ends do not meet current FAA airport design standards as described in FAA Advisory Circular 150/5300-13, *Airport Design*. The proposed action would partially correct this design standard deficiency to the extent practicable consistent with FAA Order 5200.8. FAA recognizes the RSA design standard length beyond the end of the each runway will not be fully met by this proposed action, but can be improved to enhance safety at the airport.

   The FAA's statutory mission is to ensure the safe and efficient use of navigable airspace in the United States. Pursuant to Title 49 United States Code (USC), Subtitle VII, as amended, FAA must ensure the proposed project does not derogate the safety of aircraft and airport operations at San Francisco International Airport. Legislation under *The Transportation, Treasury, Housing and Urban Development, the Judiciary, The District of Columbia, and Independent Agencies Appropriations Act, 2006* (Public Law 109-115), November 30, 2005, requires completion of Runway Safety Area improvements at all airports certificated under Title 14, Code of Federal Regulations (CFR) Part 139, to meet FAA design standards by December 31, 2015.

3. **Proposed Project and Federal Actions.** The proposed action includes site preparation, grading, as needed, installation of drainage structures, paving, installation of Engineered Materials Arresting System (EMAS), and marking and lighting of various airfield pavements the (See Figures1-6, 1-7, 1-8 and 1-9 of the Final **Environmental Assessment** (EA).

   The proposed action evaluated in this FONSI/ROD includes the following actions grouped by runway pair:

Runways 1L-19R and 1R-19L

Runway Shifts:

- Shift Runway 1R-19L end by about 200 feet to the south by extending the runway pavement at the south end of the runway by 205 feet and reducing the north end of the runway by a similar distance, thus maintaining the existing runway length.
- Shift Runway 1L-19R by about 450 feet to the south by extending the runway pavement at the south end of the runway by 450 feet and reducing the north end of the runway by a similar distance, thus maintaining the existing runway length.

North End Runways 19R/19L:

- Construct a nonstandard EMAS bed approximately 550 feet long and 220 feet wide north of the Runway 19R threshold, with a 50-foot setback from the runway end.
- Construct a nonstandard EMAS bed approximately 410 feet long and 220 feet wide north of the Runway 19L threshold, with a 35-foot setback from the runway end.
- Decommission or demolish the existing pavement of Taxiways E and L and replace/realign the taxiways to provide access to the relocated threshold of Runways 19L and 19R.
- Relocate portions of the approach lighting system for Runway 19L to accommodate the relocated landing threshold.
- Install Runway Status Lights.

South End Runways 1R/1L:

- Construct a nonstandard EMAS bed approximately 500 feet long and 220 feet wide south of the Runway 1L threshold, with a 35-foot setback from the runway end.
- Construct a nonstandard EMAS bed approximately 380 feet long and 220 feet wide south of the Runway 1R threshold, with a 35-foot setback from the runway end.
- Decommission the majority of existing Taxiway A and A-1 pavement and construct a realigned Taxiway A extending between Taxiway B and Taxiway L around the south side of the new EMAS installations at the south end of the runways.
- Construct a new taxiway between Taxiway B, Runway 1L threshold, Runway 1R threshold, and Taxiway L, with a mid-field connection to the relocated Taxiway A.
- Realign the airport operating area fence and blast fence to an area south of Realigned Taxiway A.
- Relocate an existing electrical substation.
- Relocate the existing vehicle service road and blast fence south of relocated Taxiway A and Runways 1R-19L and 1L-19R adjacent to Interstate 101.
- Construct a new box culvert over the Millbrae Highline Canal for a taxiway shoulder and realigned vehicle service road, blast fence, and airport operating area fence.
- Fill and/or reconfigure the South Oxidation Pond, Bird Ball Ditch, and associated storm water ponds for construction of the new taxiways, relocation of the vehicle service road, and installation of a new pump station.
- Install Runway Status Lights.

Runways 10L-28R and 10R-28L

East End Runways 28L/28R

- Displace the landing thresholds for Runways 28L and 28R by 300 feet to the west.
- Relocate Glide Slope navigation aids, associated 600-gallon underground fuel tank for the Glide slope antennas.
- Implement declared distances for Runways 10L-28R and 10R-28L.
- Relocate portions of the approach lighting installations for Runways 28L and 28R
- Install Runway Status Lights

West End Runways 10L/10R

- Relocate the west end of Runway 10R-28L pavement by 781 feet west to preserve the existing Runway 10R takeoff capability and stagger of parallel runway thresholds.
- Relocate the existing localizer antenna for Runway 28L.
- Construct a new taxiway connection between Taxiway S, the relocated threshold of Runway 10R, and Taxiway Z.
- Install Runway Status Lights

The federal actions necessary to carry out the proposed projects include:

- Unconditional approval of the Airport Layout Plan (ALP) to depict the proposed runway safety area improvements pursuant to 49 USC §§ 40103(b) and 47107(a)(16).

- Determination of the effects of the proposed runway safety area improvement project upon the safe and efficient use of navigable airspace pursuant to 14 CFR Part 77, *Objects Affecting Navigable Airspace*. The FAA must determine if the proposed improvements, as proposed by the City and County of San Francisco are consistent with the existing airspace utilization and procedures.

- Determination under 49 USC § 44502(b) that the airport development is reasonably necessary for use in air commerce or in the interests of national defense.

- Approval of construction of new airport pavements and installation of EMAS runway, taxiway pavements, and relocated vehicle service road and other associated development that meets FAA Airport Design Standards. (14 CFR § 139.309)

- Approval of the construction, installation, relocation and/or upgrade of various electronic and visual navigational aids including but not limited to Glide Slope; Medium Intensity Approach Lights with Runway Alignment Indicator Lights (MALSR); Precision Approach Path Indicator (PAPI); and runway threshold lights, runway end identifier lights. Installation of Approach Lighting System with Sequenced Flashers (ALSF- II). This equipment is necessary to ensure the safety of air navigation for aircraft operations at the new airport.

- Development of air traffic control and airspace management procedures designed to ensure the safe and efficient use of navigable airspace including the establishment of new Standard Instrument Departure (SID) and Standard Terminal Arrival Route (STAR) procedures.

- Approval changes to the airport certification manual pursuant to 14 CFR Part 139, (49 USC § 44706).

- Approval of changes to the airport certification manual, to maintain aviation and airfield safety during construction pursuant to 14 CFR Part 139 (49 USC § 44706).

- Determinations under 49 U.S.C § 47106 and 47107 relating to of the proposed project for Federal funding assistance under the Airport Improvement Program (AIP) under 49 USC § 40117, as implemented by 14 CFR § 158.25, to impose and use passenger facility charges (PFCs) for the proposed project[i].

- Determination of eligibility for federal assistance for the near-term development projects under the Federal grant-in-aid program authorized by the Airport and Airway Improvement Act of 1982, as amended (49 USC § 47101 et seq.).

- Approval of further processing of an application for federal assistance for near-term eligible projects using federal funds from the Airport Improvement Program, as shown on the ALP.

- Continued close coordination with the City and County of San Francisco and appropriate FAA program offices, as required, to maintain aviation and airfield safety during construction pursuant to 49 USC § 44706.

- Appropriate amendments to air carrier operations specifications pursuant to 49 USC § 44705.

4. **Reasonable Alternatives Considered.** Chapter 2 of the Final EA, used a three step alternatives analysis screening process including:

   Step 1 – Would the Proposed Alternatives enhance the airport's Runway Safety Areas consistent with FAA Advisory Circular 150/5300-13, Airport Design?

   Step 2 – Would the Alternative be practicable and consistent with FAA Order 5200.8, Runway Safety Area Program, considering existing technology and logistics in light of overall project purpose, including implementation and completion by December 31, 2015, as specified in Public Law 109-115?

   Step 3 – Would the Alternative result in a safe and efficient use of navigable airspace and minimize airfield operational impacts?

   The EA evaluated three off-airport and 27 on-airport alternatives, along with the No Action Alternative to the proposed action. Analysis of the No Action Alternative is required pursuant to Title 40, CFR § 1502.14(d). Section 2.3 of the Final EA, evaluated each of the three off-airport alternatives of "Use other Alternative Modes of Transportation;" "Use of other Area Public Airports"; and "Use of Alternative Aircraft." There are no feasible off-Airport alternatives for the location of the Runway Safety Area improvements because compliance with PL 109-115 requires the Airport sponsor meet the RSA standards. Therefore, off-airport locations were eliminated from consideration. Paragraph 405(d) of FAA Order 1050.1E states in part: "*An EA must consider the proposed action and a discussion of the consequences of taking no action, and may limit the range of alternatives to action and no action when there are no unresolved conflicts concerning alternative uses of available resources.*"

   Therefore, all off-airport alternatives were eliminated for further review because they would not meet the purpose and need of the proposed action.

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[i] Certain requirements for AIP funding overlap with environmental review requirements for approval of the ALP and so are addressed as part of the EA for the ALP. These determinations are a prerequisite to funding but do not complete the determinations that are necessary for funding. The decision to approve AIP and PFC funding are completed in separate processes.

The primary considerations for the FAA in selection of a preferred alternative include the Purpose and Need for the project and the environmental impacts of the project. In its consideration of alternatives, the FAA is mindful of its statutory charter to encourage the development and safety of civil aeronautics in the United States (49 USC § 40104). The No Action alternative has fewer environmental effects than the Proposed Action alternative; however the No Action alternative does not meet the Purpose and Need for the proposed project and CCSF would not comply with Public Law 109-115.

Sections 2.4 and 2.5 of the Final EA describe and evaluates the 27 various runway safety area improvement alternatives for all four runway ends at SFO. Table 2-3 summarizes the results of the Alternatives Screening Process. Of the 27 on-airport alternatives, three build alternatives and the no action alternative were carried forward for detailed impact analysis.

The proposed action by CCSF is a combination of several of the various alternatives. Therefore the proposed action for Runway 10L/28R is to include declared distances, as defined in paragraph 2, Definitions, of FAA Advisory Circular 150/5300-13, Airport Design as *"The distances the airport owner declares available for the airplane's takeoff run, takeoff distance, accelerate-stop distance, and landing distance requirements."* Runway 10R/28L includes using declared distances along with an extension of the runway to the west to maintain the existing relative distance separation between the two runway thresholds. Appendix 14 of FAA Advisory Circular 150/5300-13, describes the application and use of declared distances at an airport.

For Runway 1L/19R and Runway 1R/19L, Refined Alternative 6A Under this alternative the runways would be shifted to the south along with the installation of non-standard EMAS beds on both ends of each runway. Under this alternative an additional taxiway connector would be constructed between and parallel to the south ends of the two runways.

The FAA concludes that CCSF's Proposed Action is the alternative that meets the Purpose and Need of the proposed project with minimum adverse environmental effects and promotes increased aviation safety through meeting FAA Airport Design Standards, to the extent practicable pursuant to Public Law 109-115.

5. **Assessment.** The potential environmental impacts and possible adverse effects were identified and evaluated in a Final EA prepared in December 2011. The Final EA has been reviewed by the FAA and found to be adequate for the purpose of the proposed Federal action. The FAA determined that the Final EA for the proposed project adequately describes the potential impacts of the proposed action. No new issues surfaced as a result of the public review process.

The Final EA examined the following environmental impact categories: Noise; Compatible Land Use; Department of Transportation Act Section 4(f) and Land and Water Conservation Fund Act, Section 6(f) Resources, Socioeconomic Impacts, Environmental Justice and Children's Health and Safety Risks; Secondary Induced Impacts; Air Quality; Water Quality; Fish, Wildlife and Plants, Wetlands, Floodplains, Coastal Resources, Historic, Architectural, Archeological and Cultural Resources; Light Emissions and Visual Impacts; Natural Resources and Energy Supply; Hazardous Materials, Pollution Prevention and Solid Waste; and Cumulative Impacts.

The environmental impact categories of Farmlands; Wild and Scenic Rivers, and Coastal Barriers were not evaluated further because the proposed action at SFO would not pose an impact to these environmental resources.

A. Noise. Section 4.2 of the Final EA describes noise impacts resulting from the proposed action and the No Action alternatives. Sections 4.2.2.3 notes the same number of aircraft operations (takeoffs and landings) were used to evaluate both the proposed action and no action alternatives. The proposed runway safety area improvements will not induce or change the overall number of aircraft operations into and out of SFO. Section 4.2.3 of the Final EA compares the noise impacts of the No Action and Proposed Action Alternatives. The Proposed Action would result in 30 houses exposed to an increase of 1.5 decibels (dB) using the Community Noise Equivalent Level (CNEL) within the 65 dB CNEL noise

- All sheet pile driving activities will be accomplished from the existing vehicle service road and no construction equipment will enter the tidal marsh.
- A silt fence will be installed to minimize degradation of water quality, and prevent contaminants and debris from entering the water.
- All work in the tidal marsh will be conducted during low tides when the mudflat is exposed and the potential for sediment discharge is minimized.

The following measures are to be implemented for shoreline construction associated with the replacement of the storm water drainage outfall pipes:

- Outfall pipe replacement work will not occur when the tidal marsh plain is inundated. This will require work to avoid periods within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge).
- The work area perimeter will be staked and fenced with silt fencing.
- All vehicle and equipment staging and refueling areas will be located in uplands outside of the tidal marsh.
- Disturbed areas will be hydroseeded or covered with mulch.
- No construction equipment will enter the tidal marsh area.

The FAA will require the CCSF implement the measures identified in the NMFS Endangered Species Act, Section 7 consultation, and Essential Fish Habitat consultations through a special condition in an Airport Improvement Program grant offer, or approval of use of Passenger Facility Charges or similar requirements to ensure that these measures are implemented. With implementation of these measures, the proposed action's impacts on fisheries would be less than significant.

To compensate for the loss of 0.04 acres of tidal marsh, SFO will purchase and apply 0.20 acres of constructed tidal wetland mitigation habitat from the Deepwater Slough Island Wetland Mitigation Project in Redwood City, California as in-kind mitigation.

The U.S. Fish and Wildlife Service (USFWS), provided its Biological Opinion, dated November 28, 2011 to the FAA for the proposed RSA program. The USFWS included the following three Reasonable and Prudent Measures in their Biological Opinion:

1. The project proponent shall implement the proposed action, including proposed conservation measures, as described in the *Description of the Proposed Action*, of this biological opinion, unless modified by terms and conditions contained in the biological opinion.
2. The project proponent shall minimize adverse effects to the California clapper rail.
3. The project proponent shall ensure their compliance with this biological opinion.

The November 28, 2011, Biological Opinion included the following terms and conditions to implement the first two Reasonable and Prudent measures:

1. The FAA shall minimize the potential for harm or harassment of the California clapper rail resulting from the proposed action by implementing the proposed action, including proposed conservation measures, as described in *Description of the Proposed Action* of this biological opinion, with the

inclusion of or modifications by the following terms and conditions of the biological opinion for the proposed action.

2. The FAA shall include Special Provisions that incorporate the Proposed Conservation Measures and the Terms and Conditions of this biological opinion in the solicitation for bid information. In addition, the FAA shall inform all contractors and subcontractors involved in the proposed action about the requirements of this biological opinion.

3. The biologist(s) proposed by the FAA to conduct environmental awareness training for all contractor and subcontractor personnel prior to entry to the VSR relocation and outfall pipe replacement work areas shall be approved by the Service. The biologist(s) shall be experienced with and knowledgeable about California clapper rail. This training shall review sensitive biological resources (e.g., California clapper rail, jurisdictional wetlands) at the site and shall identify all protection measures to be implemented and complied with to ensure that these resources are not affected by work activities. New employees shall attend a training session prior to participation in work activities.

The following terms and conditions implement Reasonable and Prudent Measure 3:

1. If requested, before, during, or upon completion of any work activities in the action area, the FAA shall coordinate, through appropriate SFO airfield staff, to allow for access by Service personnel to the work areas to inspect effects of the proposed action to the California clapper rail and its habitat.

2. The FAA shall submit a post-project compliance report prepared by a Service-approved biologist(s) to the Service's Sacramento Fish and Wildlife Office within sixty (60) calendar days following completion of the VSR relocation and outfall pipe replacement work or within sixty (60) calendar days of any break in work activities lasting more than sixty (60) calendar days. This report shall detail:

    i. dates that construction occurred;

    ii. pertinent information concerning the success of the proposed action in meeting the Proposed Conservation Measures and Terms and Conditions of this biological opinion;

    iii. an explanation of any failure to meet such measures;

    iv. known project effects on the California clapper rail, if any;

    v. occurrences of incidental take of this listed species;

    vi. documentation of employee environmental awareness training; and

    vii. other pertinent information. The reports shall be addressed to the Deputy Field Supervisor of the Endangered Species Program in the Service's Sacramento Fish and Wildlife Office.

3. The FAA shall comply with all reporting requirements in this biological opinion. The FAA will require the CCSF implement the measures identified in the USFWS Endangered Species Act, Section 7 consultation through AIP grant assurances or similar requirements to ensure that these measures are implemented. With implementation of these measures, the proposed action's impacts on the California clapper rail would be less than significant.

- **H. Wetlands**. Section 4.9 of the Final EA notes that implementation of the Proposed Action would result in the filling of 3.72 acres of jurisdictional wetlands. The 3.72 acres includes 0.73 acre of other waters of the United States (the Bird Ball Ditch and the Millbrae Highline Canal). The 3.72 acres also includes 2.95 acres of seasonal wetland consisting of the South Oxidation Pond and depression next to Runway 28R and 0.04 acres of tidal marsh. Section 4.9.1 states "*other than the small amount of fill in the tidal marsh, the majority of the project wetland impacts (3.68 acres) would affect low-value, constructed and maintained features that are part of the storm water management system for the airfield and urban areas to the west.*"

- All sheet pile driving activities will be accomplished from the existing vehicle service road and no construction equipment will enter the tidal marsh.
- A silt fence will be installed to minimize degradation of water quality, and prevent contaminants and debris from entering the water.
- All work in the tidal marsh will be conducted during low tides when the mudflat is exposed and the potential for sediment discharge is minimized.

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- Disturbed areas will be hydroseeded or covered with mulch.
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The FAA will require the CCSF implement the measures identified in the NMFS Endangered Species Act, Section 7 consultation, and Essential Fish Habitat consultations through a special condition in an Airport Improvement Program grant offer, or approval of use of Passenger Facility Charges or similar requirements to ensure that these measures are implemented. With implementation of these measures, the proposed action's impacts on fisheries would be less than significant.

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The following terms and conditions implement Reasonable and Prudent Measure 3:

1. If requested, before, during, or upon completion of any work activities in the action area, the FAA shall coordinate, through appropriate SFO airfield staff, to allow for access by Service personnel to the work areas to inspect effects of the proposed action to the California clapper rail and its habitat.

2. The FAA shall submit a post-project compliance report prepared by a Service-approved biologist(s) to the Service's Sacramento Fish and Wildlife Office within sixty (60) calendar days following completion of the VSR relocation and outfall pipe replacement work or within sixty (60) calendar days of any break in work activities lasting more than sixty (60) calendar days. This report shall detail:

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3. The FAA shall comply with all reporting requirements in this biological opinion. The FAA will require the CCSF implement the measures identified in the USFWS Endangered Species Act, Section 7 consultation through AIP grant assurances or similar requirements to ensure that these measures are implemented. With implementation of these measures, the proposed action's impacts on the California clapper rail would be less than significant.

H. Wetlands. Section 4.9 of the Final EA notes that implementation of the Proposed Action would result in the filling of 3.72 acres of jurisdictional wetlands. The 3.72 acres includes 0.73 acre of other waters of the United States (the Bird Ball Ditch and the Millbrae Highline Canal). The 3.72 acres also includes 2.95 acres of seasonal wetland consisting of the South Oxidation Pond and depression next to Runway 28R and 0.04 acres of tidal marsh. Section 4.9.1 states "*other than the small amount of fill in the tidal marsh, the majority of the project wetland impacts (3.68 acres) would affect low-value, constructed and maintained features that are part of the storm water management system for the airfield and urban areas to the west.*"

Consistent with Executive Order 11990, *Protection of Wetlands*, the EA shows in Section 4.9, the proposed action will not adversely affect public health, safety, and welfare, including water supply, quality, recharge and discharge; pollution; flood and storm hazards, and sediment and erosion. Further, the proposed action will not inhibit maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources; and other uses of wetlands in the public interest, including recreational, scientific, and cultural uses.

Mitigation for the impacts to wetlands totaling 3.72 acres are described in Section 4.9.5 of the Final EA. To implement the proposed project the CCSF will need to obtain a Clean Water Act, Section 404 permit from the U.S. Army Corps of Engineers. CCSF will compensate for impacts to 0.04 acres tidal wetlands by purchasing before construction of the proposed project 0.20 acres of agency recognized constructed tidal wetland mitigation from the Deepwater Slough Island Wetland Mitigation Project in Redwood City, California. This will serve as in-kind mitigation to compensate for the 0.04 acres of direct and indirect impacts to tidal wetlands, as well as for mitigation to California clapper rail impacts described above. CCSF plans to obtain that permit and compensate for the remaining 3.68 acres of non-tidal wetland impacts not already addressed in the compensation for impacts to California clapper rail at a mitigation ratio of 2:1 resulting in a target compensation of about 7.5 acres. Finalization of this mitigation will be completed during the Clean Water Act, Section 404 permit process with the Army Corps of Engineers before construction of the proposed project. In additional to the U.S. Army Corps of Engineers, Clean Water Act, Section 404 permitting requirements, the FAA will require the CCSF implement the measures identified in Final EA through AIP grant assurances or similar requirements to ensure that these measures are implemented. With implementation of these measures, the proposed action's impacts on wetlands would be less than significant.

I. Floodplains, Section 4.10 of the Final EA notes the proposed action is located partly within a 100-year floodplain from San Francisco Bay. The FAA has determined that the proposed action would not result in further encroachment into the 100-year floodplain. FAA has determined the relocation of the airports perimeter road near the approach end of Runway 1R and restoration of the Runway Safety Area does not meet the definition of a "significant encroachment" described in DOT Order 5650.2, *Floodplain Management and Protection*, dated 23 April 1979, which implements the requirements of Executive Order 11988 *Floodplain Management*, defines a "significant encroachment" as one that involves the following three criteria: (1) a considerable probability of loss of human life, (2) likely future damage associated with the encroachment that could be substantial in cost or extent including the interruption of service on or loss of a vital transportation facility, and (3) a notable adverse impact on natural and beneficial floodplain values. Therefore, the proposed action's impact on the floodplain is less than significant.

J. Coastal Resources. Section 4.11 of the Final EA states FAA has not established thresholds of significance for impacts on coastal resources. Section 4.11.3.2 of the Final EA states the proposed action would not change public access to San Francisco Bay. Public access to the bay on Bay Conservation and Development Commission (BCDC) shoreline jurisdictional areas on the airport property is not permitted. The proposed action will install new wood timber piles for the Airport owned wooden trestles for the FAA's Approach Lighting System. Section 4.11.4 of the Final EA states the construction related impacts of the proposed action would be consistent with the policies of the Bay Plan, and no significant impacts on coastal resources are anticipated.

K. Historic, Architectural, Archaeological and Cultural Resources. Section 4.12 of the Final EA references documentation from the California State Historic Preservation Office (SHPO) indicating they concurred by letter dated February 1, 2011, with the FAA's delineation of the Area of Potential Effect (APE). On August 26, 2011, the California SHPO concurred with FAA's determination that there are no historic properties found within the APE. The California SHPO also concurred with FAA's finding that the proposed undertaking would not affect any historic properties listed or eligible for listing on the National Register of Historic Places. (See **Appendix D** of the Final EA). The California SHPO recommended an archaeological monitor be present when working in fill predating the 1970s. FAA believes presence of an archaeological monitor during excavation of soil for the proposed RSA project is appropriate. In the event that an artifact is discovered during earthmoving activities, work will be temporarily suspended in the immediate vicinity of the artifact in order for the archaeological monitor to determine if further investigation is necessary. In the event any human remains are discovered the following procedures will be used:

A. In the event that suspected human remains are discovered, the archaeological field director or the Lead Environmental Inspector (LEI) will stop excavation immediately and notify their supervisors immediately. No bones or associated artifacts will be removed until further notice from these supervisors. A reasonable effort will be made to protect human remains from further damage or intrusion.

B. The supervisor(s) will direct that all ground disturbing activity within 100 feet of the find be stopped until notified in writing that work can recommence. The area of the remains will be clearly marked with flagging or safety fencing and guarded as needed.

C. The field supervisor(s) will immediately notify the FAA Project Manager and CCSF (during construction, restoration, and remediation). The LEI during construction also will be notified to oversee stop-work actions in the find area. The appropriate Project Manager/or CCSF designated Contractor in Charge (CIC) will direct the Archaeological Monitor to evaluate the find The Archaeological Monitor will complete on-ground evaluation of the find within 24 hours of notification.

D. If the human remains are not obviously prehistoric in nature (e.g., in direct association with prehistoric artifacts), the Archaeological Monitor or LEI will report the burial to the San Francisco Police Department (SFPD) Dispatch office so the coroner or other officer can inspect the site and determine if a criminal investigation is necessary.

E. The Archaeological Monitor or LEI will report the discovery to the FAA, and CCSF's CIC. The CCSF will report to the discovery to the California SHPO (Mr. Tristan Tozer, Telephone 916.445.7027) concurrently with notification of SFPD law enforcement officials

   If the Archaeological Monitor cannot make a reasonable assessment of the discovery, then a physical anthropologist or bio-archaeologist will be called in to identify whether the remains could be of Native American or other ancestry. This may involve uncovering the skeleton if the necessary measurements cannot be taken in the field. It also may be necessary to expand the excavation to facilitate viewing the skeleton in situ and determine the context. Full excavation and/or removal of the remains will not occur until the appropriate Native American representatives are notified and have had an opportunity to comment. Removal and reburial or other appropriate treatment options will be discussed with the appropriate Native American representatives. Any field methodology proposed will be conducted in consultation the California SHPO. Tables of skeletal attributes, and/or computer programs such as FORDISC, should be consulted to compare the skeletal measurements with existing human populations. If the measurements match those for Native American populations, or if there is doubt as to ancestry, they will be assumed to be Native

American. Human remains found within prehistoric contexts will be assumed to be Native American, unless skeletal or site information strongly suggests otherwise.

F. For Native American remains, the FAA, in consultation with the California SHPO, will notify the designated Tribal monitor(s) as soon as a determination is made.

The FAA will require the CCSF implement the measures identified in consultation with the SHPO through AIP grant assurances or similar requirements to ensure that these measures are implemented. With implementation of these measures, the proposed action's impacts on historic properties would be less than significant.

L. Light Emissions and Visual Impacts are described in Section 4.13 of the Final EA. Section 4.13.3.2 of the Final EA notes the proposed action includes relocation of runway and taxiway lights and signage, relocation of the approach lighting system mounted on the trestles in San Francisco Bay and installation of runway status lights. This section of the EA states the proposed action would not increase the amount of nighttime lighting within the Area of Potential Effect and affecting the Study Area. There would be no significant light emissions as a result of the proposed action alternative.

M. Natural Resources and Energy Supply. Section 4.14 of the Final EA states the proposed action alternative and the No Action Alternative would not have a significant impact on natural resources that are unusual or in short supply. The proposed action would not increase aircraft operations or use of the Airport compared to the No Action Alternative.

N. Hazardous Materials, Pollution Prevention and Solid Waste. Section 4.15 of the Final EA notes construction associated with the proposed action would involve shallow excavation and grading, except for deeper excavation for the electrical substation, pump station and the relocated seawall. Implementation of Best Management Practices to avoid spillages of fuels, greases, and oils, would reduce potential impacts.

O. Cumulative Impacts The past, present and reasonably foreseeable cumulative actions included in the cumulative impact analysis are presented in Section 3.15, Past, Present, and Reasonably Foreseeable Future Actions. An evaluation of cumulative impacts from these cumulative actions is discussed in Section 4.16 of the Final EA and no significant cumulative impacts were identified.

P. Environmentally Preferred Alternative and FAA Preferred Alternative

In connection with its decision to approve the proposed ALP revisions, the FAA considered the environmental impacts from the Proposed Action and the No Action Alternatives. The FAA determined that all practicable means to avoid or minimize environmental harm from the Proposed Action have been adopted and there would be no significant environmental impacts from the proposed circulation and flood control improvements and that the project would not jeopardize the safe and efficient operations at the Airport. The No Action alternative has fewer environmental effects than the Proposed Action alternative and thus would be the environmentally preferred alternative. However, the No Action alternative does not meet the Purpose and Need for the proposed project and does not allow the CCSF to comply with the provisions of Public Law 109-115. Thus, the FAA's preferred alternative is the Proposed Action, because it meets the Purpose and Need of the proposed project with minimum adverse environmental effects. Further, it also meets FAA's statutory mission to ensure the safe and efficient use of navigable airspace by enhancing aviation safety through improved runway safety areas at SFO.

6. **Public Participation.**

The public was encouraged to review and comment on the Draft EA which was release for public review on June 24, 2011. The City and County of San Francisco published a notice of availability of the Draft EA in the following local newspapers in the vicinity of the airport: *San Francisco Chronicle, San Mateo County Times*, and the *San Jose Mercury News*. The City and County made the Draft EA available on their web site, in the local libraries, the Airport administrative offices and the FAA's Western Pacific Region Office and at the FAA's San Francisco Airports District Office. A Public Hearing to receive public comment on the Draft EA Floodplains and Endangered Species resource evaluations was held on July 28, 2011 in the Chetcuti room in the City of Millbrae, California. No verbal comments were received during the Public Hearing. The public review of the Draft EA ended on July 29, 2011. One letter was received during the comment period and one comment card was submitted during the public hearing. No new issues surfaced as a result of the public review process. As stated on Page 5-15 of the Final EA, SFO and FAA did not receive any comments during the 10-day period following the public hearing consistent with FAA Order 5050.4B, SFO and FAA would have considered reasonable comments submitted after the public hearing until the time of completion of the Final EA. Copies of the newspaper Affidavit of Publications are provided in Appendix F2 of the Final EA.

7. **Inter-Agency Coordination.**

In accordance with 49 USC § 47101(h), the FAA has determined that no further coordination with the U.S. Department of Interior or the U.S. Environmental Protection Agency is necessary because the Proposed Action does not involve construction of a new airport, new runway or major runway extension that has a significant impact on natural resources including fish and wildlife; natural, scenic, and recreational assets; water and air quality; or another factor affecting the environment.

8. **Reasons for the Determination that the Proposed Action will have No Significant Impacts.**

The attached Final EA examines each of the various environmental resources that were deemed present at the project location, or had the potential to be impacted by the Proposed Action. The proposed Runway Safety Area Improvement Project at San Francisco International Airport would not involve any environmental impacts, after mitigation, that would exceed the threshold of significance as defined by FAA Orders 1050.1E and 5050.4B. Based on the information contained in the Final EA, the FAA has determined that the Proposed Action is the most feasible and prudent alternative. The FAA has decided to implement the Proposed Action as described in Section 3 of this FONSI.

9. **Agency Findings.**

The FAA makes the following determination for this project based on information and analysis set forth in the Final EA and other portions of the administrative record.

a. **Floodplain**: As discussed in Section 5 of this FONSI/ROD and Sections 3.10 and 4.10 of the Final EA, the Proposed Action would occur within the 100-year floodplain for San Francisco Bay. The FAA evaluated practicable alternatives to avoid the floodplain in accordance with EO 11988 *Floodplain Management*. The FAA has determined that the selected alternative would not involve a significant encroachment on a floodplain as defined in DOT Order 5650.2, which implements Executive Order 11988. These Orders establish a policy to avoid supporting construction within a 100-year floodplain where practicable, and where avoidance is not practicable, to ensure that the construction design minimizes potential harm to or within the floodplain. No prudent or feasible alternatives which would avoid the floodplain and provide the floodplain protections incorporated into the Proposed Action were identified. As a result of the floodplain management improvements included in the Proposed Action, the FAA finds that the Proposed Action is designed to minimize risks for flood-related property loss, impacts on human safety, health, and welfare. The FAA has determined that the selected alternative would not involve a significant encroachment on a floodplain as defined in DOT Order 5650.2, which implements Executive Order 11988. These Orders establish a policy to avoid

supporting construction within a 100-year floodplain where practicable, and where avoidance is not practicable, to ensure that the construction design minimizes potential harm to or within the floodplain

b. Wetlands: Consistent with the provisions of Executive Order 11990 - *Protection of Wetlands*, dated May 24, 1977, FAA finds there is no practicable alternative to construction in wetlands located on the airport property. As discussed in Section 5H of this FONSI/ROD and sections 3.9 and 4.9 of the Final EA, the Proposed Action would include new construction in wetlands. The FAA has determined that all practicable measures have been taken to minimize the harm have been included.

c. Independent and Objective Evaluation: As required by the Council on Environmental Quality (40 CFR § 1506.5) the FAA has independently and objectively evaluated this proposed project. As described in the Final EA, the Proposed Action and the No Action alternatives were studied extensively to determine the potential impacts and appropriate mitigation measures for those impacts. The FAA provided input, advice, and expertise throughout the analysis, along with administrative and legal review of the project.

10. Decision and Orders.

Based on the information in this FONSI/ROD and supported by detailed discussion in the Final EA, the FAA has selected the proposed Runway Safety Area Improvement Program as the FAA's Preferred Alternative. The FAA must select one of the following choices:

- Approve agency actions necessary to implement the Proposed Action, or
- Disapprove agency actions to implement the Proposed Action.

Approval signifies that applicable federal requirements relating to the proposed airport development and planning have been met. Approval permits the City and County of San Francisco to proceed with implementation of the Proposed Action and associated mitigation measures. Disapproval would prevent the City and County of San Francisco from implementing the Proposed Action elements within the San Francisco International Airport.

Under the authority delegated to me by the Administrator of the Federal Aviation Administration, I find that the project is reasonably supported. I, therefore, direct that action be taken to carry out the agency actions discussed more fully in Section 3 of this FONSI/ROD.

1. Unconditional approval of the portion of the Airport Layout Plan (ALP) that depicts the proposed Runway Safety Area Improvement Program submitted by the City and County of San Francisco for San Francisco International Airport pursuant to 49 USC §§ 40103(b), 44718 and 47107(a)(16) and 14 CFR Part 77. The approval of the ALP is based on determinations through the aeronautical study process regarding obstructions to navigable airspace, and that the airport development proposal is acceptable from an airspace perspective.

2. Continued close coordination with the City and County of San Francisco and appropriate FAA program offices, as required, to maintain aviation and airfield safety during construction.

3. Approval to proceed with further processing of an application for Federal assistance for those eligible development projects described as the Proposed Action within the Final EA and this FONSI/ROD, under 49 USC §§ 47106 and 47107 for the AIP, and under 49 USC § 40117, as implemented by 14 CFR § 158.25, to impose and use passenger facility charges (PFC's) collected at San Francisco International Airport to assist with construction and operation of the potentially eligible development items shown on the ALP .

4. Determination under 49 USC § 44502(b) that the proposed Runway Safety Area Improvement development is reasonably necessary for use in air commerce or the in the interests of national defense.

This order is issued under applicable statutory authorities, including 49 USC §§ 40101(d), 40103(b), 40113(a), 44701, 44706, 44718(b), and 47101 et seq.

I have carefully and thoroughly considered the facts contained in the attached EA. Based on that information, I find the proposed Federal action is consistent with existing national environmental policies and objectives of Section 101(a) of the National Environmental Policy Act of 1969 (NEPA).
I also find the proposed Federal action will not significantly affect the quality of the human environment or include any condition requiring any consultation pursuant to section 102(2)(C) of NEPA. As a result, FAA will not prepare an EIS for this action.

APPROVED:

Brian Q. Armstrong Acting Manager, Airports Division, AWP-600	12/9/11 Date

DISAPPROVED:

Brian Q. Armstrong Acting Manager Airports Division, AWP-600	Date

RIGHT OF APPEAL

This decision, including any subsequent actions are taken pursuant to 49 USC § 40101 et seq., and constitutes a final order of the Administrator which are subject to review by the Courts of Appeals of the United States in accordance with the provisions of 49 USC § 46110.

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CHAPTER 1.0
PURPOSE AND NEED

1.1 INTRODUCTION

The City and County of San Francisco (CCSF), as owner and operator of San Francisco International Airport (SFO or the Airport), proposes to construct various improvements to the Runway Safety Areas (RSAs) for each of its four runways at SFO. This effort is being undertaken by CCSF in response to the requirements of *The Transportation, Treasury, Housing and Urban Development, the Judiciary, The District of Columbia, and Independent Agencies Appropriations Act, 2006* (Public Law [P.L.] 109-115), November 30, 2005. P.L. 109-115 requires completion of RSA improvements by airport sponsors that hold a certificate under Title 14, Code of Federal Regulations (CFR), Part 139, to meet Federal Aviation Administration (FAA) design standards by December 31, 2015.

This Environmental Assessment (EA) has been prepared pursuant to the requirements of Section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA), and Section 509(b)(5) of the *Airport and Airway Improvement Act of 1982*, as amended. The FAA is the lead federal agency to ensure compliance with NEPA for airport development actions. The EA has also been prepared in accordance with FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*; and FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions.* This EA is intended to identify and consider potential environmental impacts related to the proposed implementation of the SFO RSA Program.

This chapter includes a brief description of SFO; a description of the Proposed Action; a discussion of the need for and purpose of the Proposed Action; a description of the requested federal actions; a summary of applicable federal EA processes and procedures; and a description of the format of this EA.

1.2 BACKGROUND INFORMATION

1.2.1 DESCRIPTION OF EXISTING AIRPORT

CCSF owns and operates SFO through the San Francisco Airport Commission. The Airport is located in unincorporated San Mateo County approximately 13 miles south of downtown San Francisco, California. The Airport is within the jurisdiction of CCSF. SFO is located east of U.S. Highway 101 (U.S. 101) and adjacent to San Francisco Bay, near the cities of South San Francisco, San Bruno, and Millbrae. **Figure 1-1** depicts SFO in its regional setting. The FAA-approved existing Airport Layout Plan is shown on **Figure 1-2**.

As shown on **Figure 1-2**, the airfield system at SFO is comprised of two sets of parallel runways that are arranged in a crossing configuration. Two parallel runways are orientated in a north-south configuration and are referred to as the 1-19 system. This system consists of runways designated 1R-19L and 1L-19R. The runway number indicates magnetic heading (i.e., the runway number 1 indicates that the runway has a magnetic heading within 5 degrees of 010°). The 1-19 runway system is bisected by the east-west oriented parallel runways of the 10-28 system. This system consists of runways designated 10R-28L and 10L-28R. The separation between parallel runways at SFO is 750 feet measured from the runway centerlines.

SFO is the largest air carrier airport in the San Francisco Bay Area. Other air carrier airports in the San Francisco Bay Area include the Oakland International Airport and San Jose International Airport. The FAA's 2010 Terminal Area Forecast (TAF) shows that SFO had a total of 371,291 annual aircraft operations in 2010 (FAA, 2010a). The TAF is the official forecast published by the FAA of the airports in the National Plan of Integrated Airport Systems. An aircraft operation is one landing, takeoff, or touch-and-go procedure, as defined in Appendix A of FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*. The TAF indicates that the total passenger enplanements (passengers departing on aircraft) at SFO were 16,914,820 for the same year. SFO is also important for the transportation of air cargo. In 2010, approximately 426,724 metric tons of air cargo was transported through the Airport.

Table 1-1 provides key additional information regarding the runways at SFO that is important to the development of the Proposed Action and the consideration of alternatives for accomplishing the project purpose.

Table 1-1
Summary of Key Existing Runway Characteristics at San Francisco International Airport

Runway	Length (feet)	Displaced Landing Threshold (feet)	Landing Distance Available (feet)	Design Aircraft	ARC
1R-19L	8,648	–	–	Airbus A380-800[1]	D-VI
1R	–	238	8,410	–	–
19L	–	None	8,648	–	–
1L-19R	7,500	–	–	Boeing 757-200	C-IV
1L	–	491	7,009	–	–
19R	–	None	7,500	–	–
10R-28L	10,602	–	–	Boeing 747-400ER	D-V
10R	–	None	10,602	–	–
28L	–	None	10,602	–	–
10L-28R	11,870	–	–	Airbus A380-800[1]	D-VI
10L	–	None	11,870	–	–
28R	–	None	11,870	–	–

Notes:
[1] Future design aircraft.
ARC = Airport Reference Code
Sources: Jeppesen Sanderson, Inc., 2008; R&A, 2010a, 2010b, 2010c; SFO, 2008.

1.2.2 DESCRIPTION OF EXISTING RUNWAY SAFETY AREAS

Chapter 1 of FAA AC 150/5300-13, *Airport Design* defines an RSA as "an identified surface surrounding the runway prepared and suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." Table 3-3 of the FAA AC includes the required RSA dimensions for an airport such as SFO, serving large commercial aircraft in Approach Categories C

LEGEND

County Boundary

0 3 6 MILES

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REGIONAL SETTING

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-1

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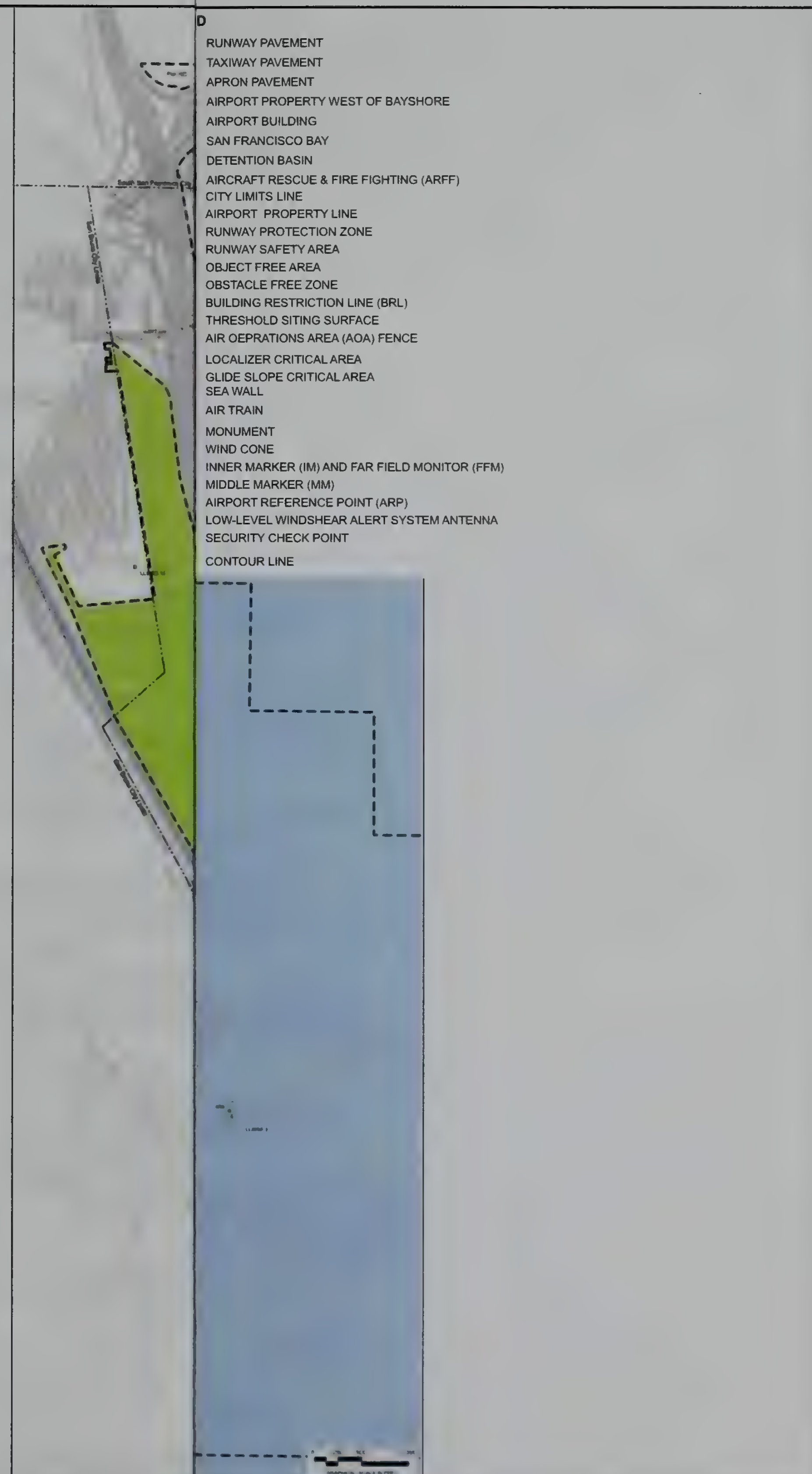

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0 1,000 2,000 FEET

AIRPORT LAYOUT PLAN

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-2

AIRPORT LAYOUT PLAN

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-2

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and D, which are shown below. Chapter 1 of the FAA AC defines aircraft approach categories A to E, which represent groupings of aircraft based on 1.3 times their stall speed in their landing configuration at the certificated maximum flap setting and maximum landing weight under standard atmospheric conditions. Because all runways at SFO can be used in either direction depending on wind conditions, the RSA dimension requirements outlined below apply to both ends of each runway.

RSA Dimensions	Approach Category C and D (feet)
RSA Width	500
RSA Length Prior to Landing	600
RSA Length Beyond the Runway	1,000

An inventory of existing RSA conditions at SFO was collected from data in previous studies, drawings from the Airport Layout Plan, and available survey information. RSA deficiencies were quantified to the extent that they do not meet applicable RSA standards (R&A, 2010a, 2010b). The reasons for these RSA deficiencies were determined to be primarily associated with limits imposed by service roads, surface storm water detention basins, and the San Francisco Bay; along with some navigational aids that are located within the RSA. Key RSA dimensions and deficiencies at SFO are summarized by runway in the following paragraphs and in **Table 1-2**. These existing RSA conditions of Runways 1L-19R and 1R-19L and Runways 10R-28L and 10L-28R are also presented on **Figures 1-3** and **1-4**, respectively.

Table 1-2
Summary of Existing Runway Safety Area Conditions
San Francisco International Airport

Runways and Runway Ends	RSA Available Length from Runway Approach End[1] (feet)	Meets FAA Standards?	Deficiency (feet)	Limits of RSA Design
Runways 1L-19R and 1R-19L				
1L	609	No	391	South Detention Basin
1R	777	No	223	South McDonnell Road, U.S. 101, and Millbrae Highline Canal
19L	246	No	754	San Francisco Bay
19R	177	No	823	San Francisco Bay
Runways 10L-28R and 10R-28L				
10L	1,000	Yes[2]	N/A	-
10R	1,000	Yes[2]	N/A	-
28L	324	No	676	San Francisco Bay
28R	322	No	678	San Francisco Bay

Notes:

1. RSAs at SFO are 500 feet wide centered along the runway centerline. A 500-foot-wide RSA complies with the width dimensions required in FAA Advisory Circular 150/5300-13, *Airport Design*.
2. The existing RSAs of Runways 10L and 10R do not meet FAA Airport Design Standards due to existing navigational aids (made out of nonfrangible materials) located within the standard dimensions of the RSAs.

FAA = Federal Aviation Administration
N/A = Not applicable
RSA = Runway Safety Area
U.S. 101 = U.S. Highway 101

Sources: R&A, 2010a; R&A, 2010b

1.2.3 RECENT RELATED STUDIES

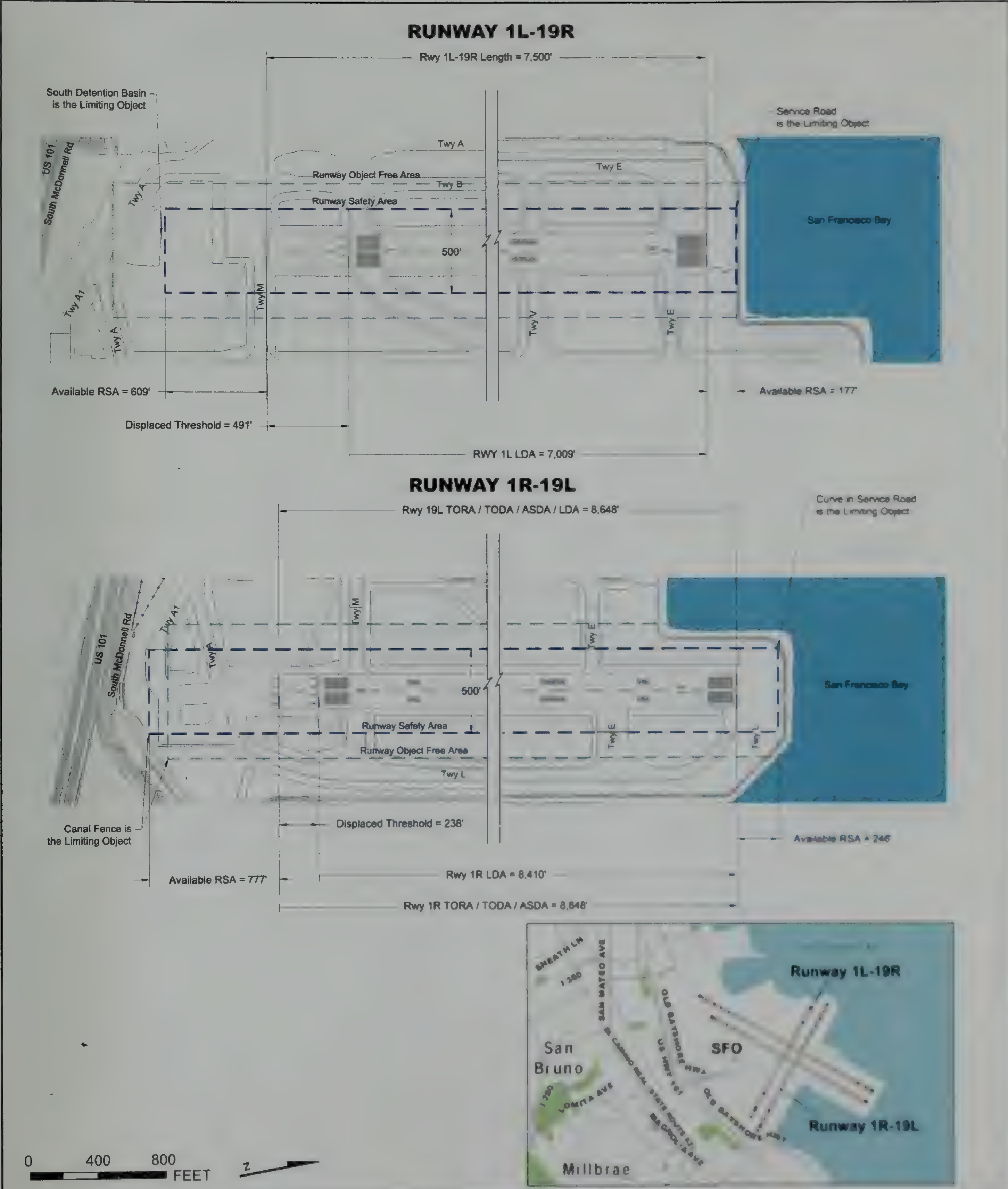
Based on the requirements of P.L. 109-115 (discussed further in **Section 1.4**), the FAA requested that SFO evaluate and determine whether all the RSAs at the Airport met current FAA design standards. As described in **Section 1.2.2**, these RSA studies included a review of existing conditions and identified deficiencies with current RSA standards. The RSA studies also included the development of several RSA alternatives to comply or provide an equivalent level of safety with standards included in FAA AC 150/5300-13, *Airport Design*. The Airport established an RSA Study Working Group to provide input and evaluate the various RSA alternatives, and to ensure the needs of the various airport users were considered. The RSA Study Working Group was made up of representatives from various divisions within SFO, FAA, and airlines operating at the Airport. A report summarizing the findings of these RSA studies was prepared for each of the two runway systems (R&A, 2010a, 2010b). The executive summaries of these RSA studies are provided in **Appendix A1** of this EA. **Chapter 2.0** of this EA includes additional information relating to the various RSA alternatives developed and the determination of the preferred RSA alternatives.

1.3 DESCRIPTION OF PROPOSED ACTION

CCSF is proposing to implement the SFO RSA Program, which involves improving the RSAs of Runways 10L-28R, 10R-28L, 1R-19L, and 1L-19R to enhance safety. The SFO RSA Program is based on the preferred alternatives from the RSA studies completed in August 2010. CCSF's preferred RSA alternatives and associated improvements are referred to in this document as the Proposed Action. The various components of the Proposed Action are presented on **Figures 1-5** through **1-11**, and are described below.

The Proposed Action involves a combination of runway shifts and other improvements, and occur in four geographic locations (at the two ends of each pair of parallel runways). The RSA Study Working Group determined that it is not practicable to create RSAs for Runways 1L-19R and 1R-19L that meet the current FAA design standards because of the position of the runways relative to San Francisco Bay and U.S. 101. An Engineered Materials Arresting System (EMAS) is proposed to be installed at these runway ends to enhance the RSAs. An EMAS is a specialized system installed in the RSA beyond the runway end, made of high energy absorbing materials. When an aircraft overruns the runway, these materials are crushed, absorbing the forward momentum of the aircraft and decelerating and arresting the aircraft's movement. Section 4 of FAA AC 150/5220-22A, *Engineered Materials Arresting Systems for Aircraft Overruns,* indicates that a standard EMAS provides a level of safety that is generally equivalent to a full RSA built to the dimensional standards in FAA AC 150/5300-13, *Airport Design*. Final detailed design of the EMAS installation would be undertaken after environmental review is completed. Sample EMAS installations are presented in **Figure 1-12**.

The Proposed Action also includes the use of "declared distances" for several of the runways. Declared distances are defined in Chapter 1 of FAA AC 150/5300-13. They involve the designation of specific lengths of runway pavement that are available for use by pilots in planning takeoffs or landings using that runway, considering the capabilities of their aircraft for safe operations, the Operations Specifications of the aircraft operator approved by the FAA under 14 CFR Part 119, or the operational standards of the aircraft operator. These designations allow remaining portions of the runway pavement to be designated



LEGEND

Runway Object Free Area

Runway Safety Area

Note:

1. Displaced threshold and declared distances are defined in Appendix B1 of this EA

Source:

R&A (2010b), Exhibits 2-2 and 2-3 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations

ASDA	Accelerate-Stop Distance Available
LDA	Landing Distance Available
RSA	Runway Safety Area
Rwy	Runway
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

EXISTING RUNWAY SAFETY AREA CONDITIONS RUNWAYS 1L-19R AND 1R-19L

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-3

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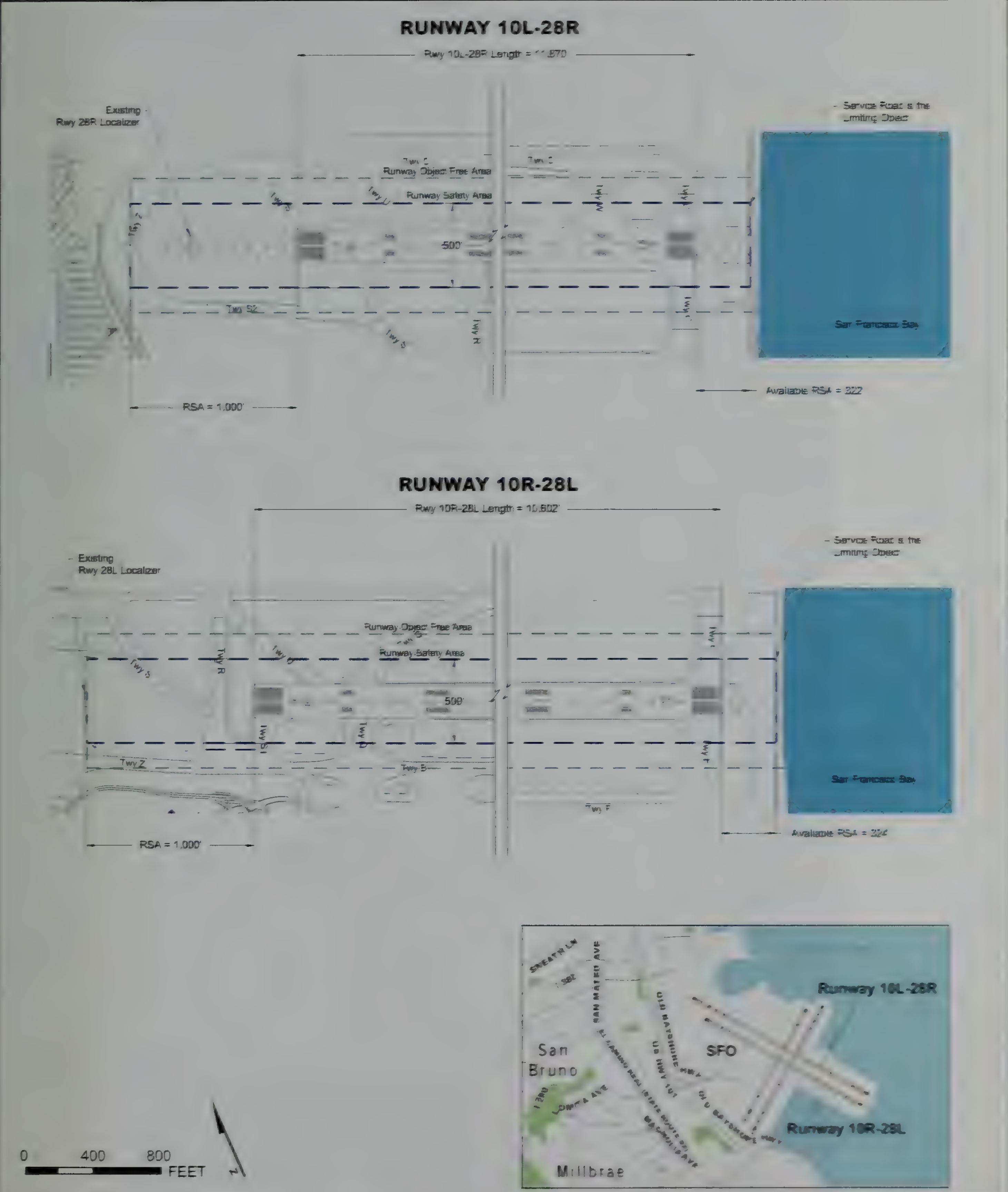

LEGEND

Runway Object Free Area
Runway Safety Area

Acronyms and Abbreviations

RSA	Runway Safety Area
Rwy	Runway
Twy	Taxiway

Source
R&A (2010a), Exhibits 2-2 and 2-3 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

EXISTING RSA CONDITIONS
RUNWAYS 10L-28R AND 10R-28L

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-4

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PROPOSED ACTION – KEY MAP

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-5

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PROPOSED ACTION – RUNWAYS 10L-28R AND 10R-28L (EAST END)

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-6

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LEGEND

New Runway Pavement [1]

New Taxiway

Other New Asphalt Concrete

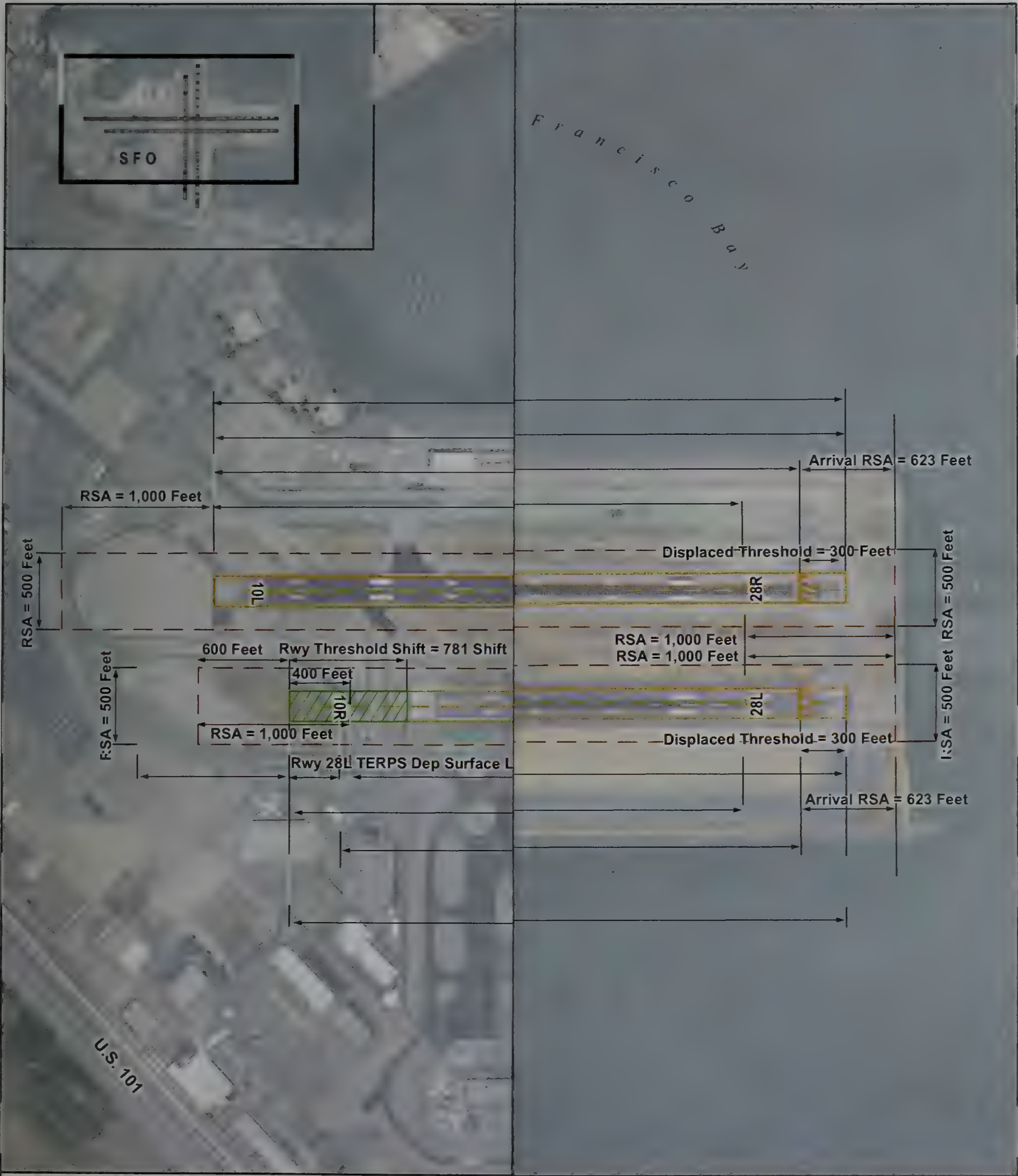
0 250 500 FEET

Note:
1. To maintain existing usable runway length and less than 499-foot runway stagger.

PROPOSED ACTION – RUNWAYS 10L-28R AND 10R-28L (WEST END)

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-7



LEGEND

New Runway Striping

Runway Safety Area

New Runway Pavement

Note:
1. Displaced thres

Acronyms and Ab
ASDA = Accelera
Dep = Departure
LDA = Landing D
RSA = Runway S
Rwy = Runway
TERPS = Termin
TODA = Takeoff D
TORA = Takeoff R

PROPOSED ACTION – LAYOUT PLAN – RUNWAYS 10L-28R AND 10R-28L

San Francisco International Airport
Runway Safety Area Program Final EA
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FIGURE 1-8

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LEGEND

- New Runway Striping
- Runway Safety Area
- New Runway Pavement

Note
1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.

Acronyms and Abbreviations
ASDA = Accelerate-Stop Distance Available
Dep = Departure
LDA = Landing Distance Available
RSA = Runway Safety Area
Rwy = Runway
TERPS = Terminal Instruments Procedures
TODA = Takeoff Distance Available
TORA = Takeoff Run Available

PROPOSED ACTION – LAYOUT PLAN – RUNWAYS 10L-28R AND 10R-28L

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-8

LEGEND

- Engineered Materials Arresting System
- Relocated Taxiway
- Other New Asphalt Concrete
- Decommissioned Taxiway

0 250 500 FEET

PROPOSED ACTION - RUNWAYS 1R-19L AND 1L-19R (NORTH END)

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Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-9

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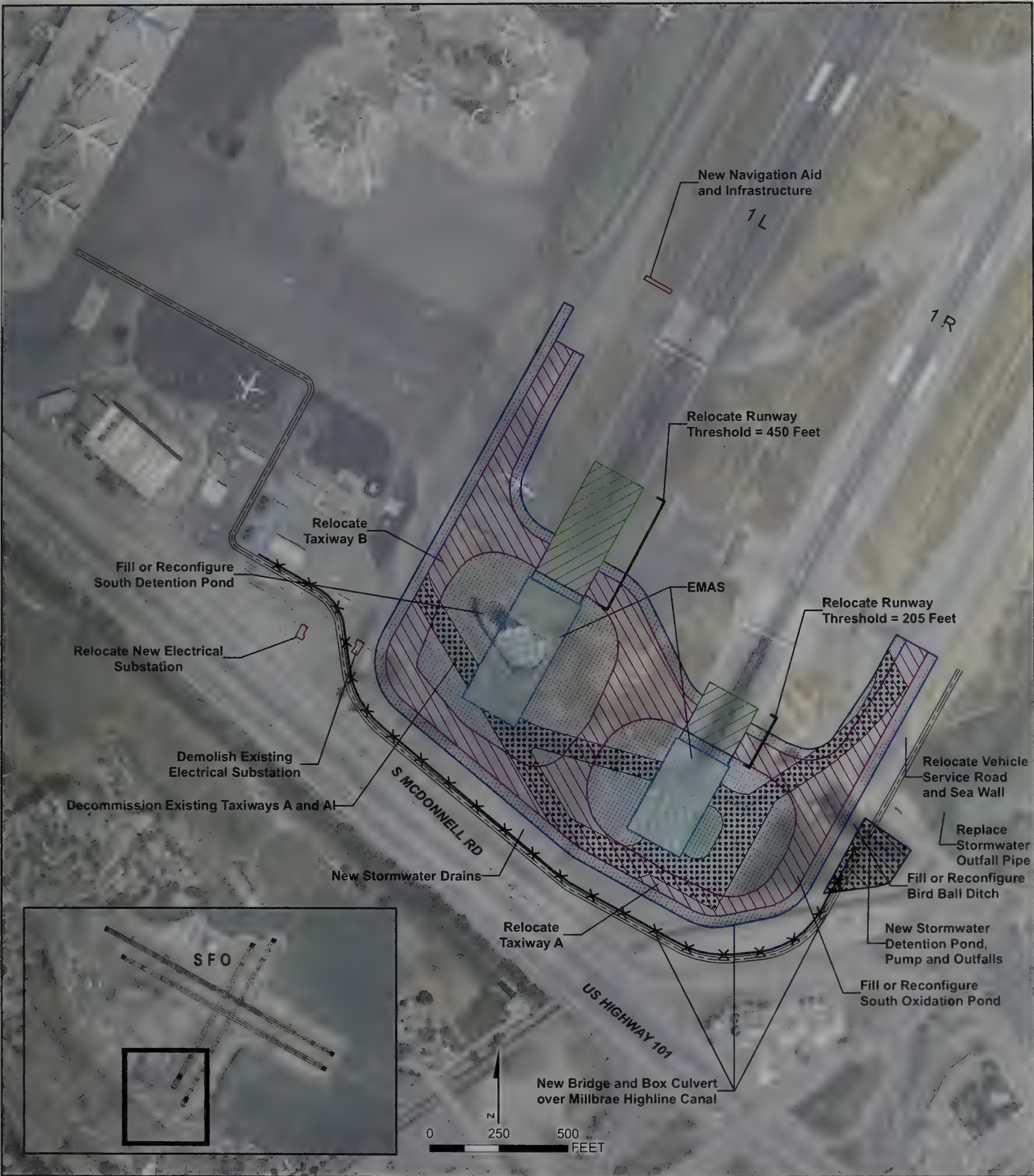

LEGEND

- Relocated Blast Fence
- Relocated Vehicle Service Road
- Engineered Materials Arresting System
- New Runway Pavement [1]
- Relocated Taxiway
- Other New Asphalt Concrete
- Decommissioned Taxiway

Note:
1. To maintain existing runway length

PROPOSED ACTION – RUNWAYS 1L-19R AND 1R-19L (SOUTH END)

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-10

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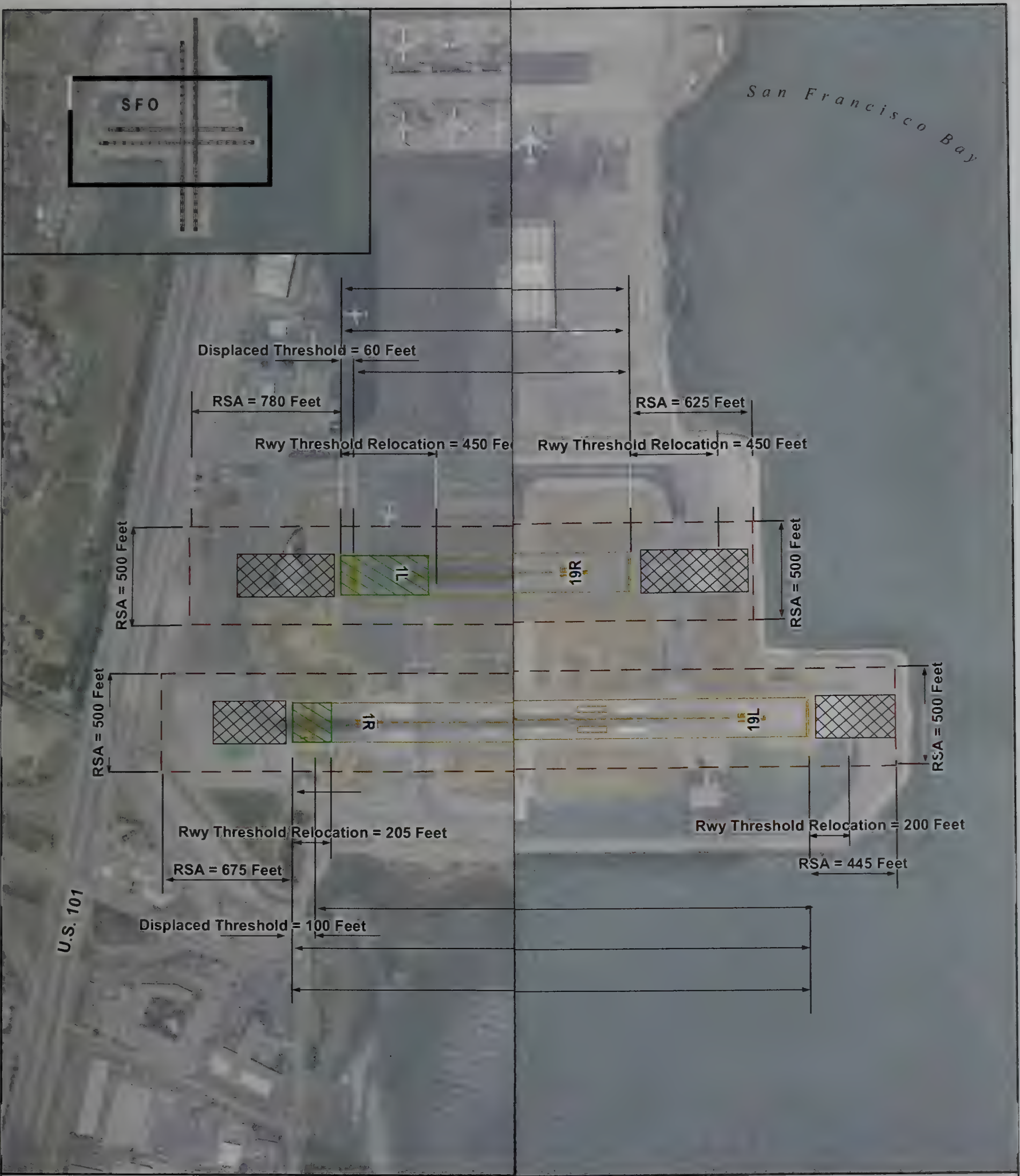

LEGEND

- New Runway Striping
- Runway Safety Area
- Engineered Materials Arresting System
- New Runway Pavement

Note:
1. Displaced thres

Acronyms and Ab
ASDA = Accelerat
LDA = Landing Di
RSA = Runway S
Rwy = Runway
TODA = Takeoff D
TORA = Takeoff R

PROPOSED ACTION - LAYOUT PLAN - RUNWAYS 1R-19L AND 1L-19R

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-11

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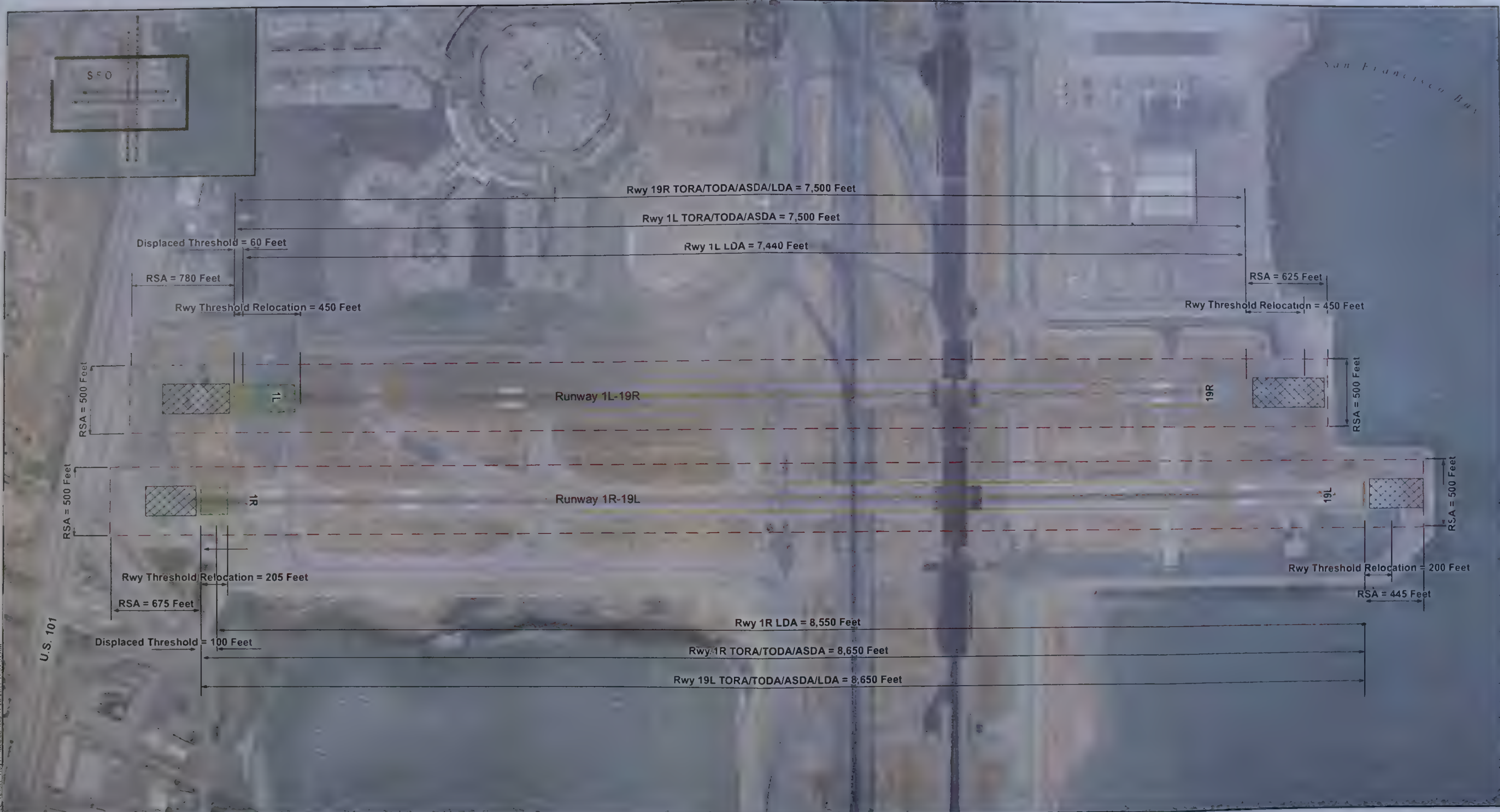


LEGEND

- New Runway Striping
- Runway Safety Area
- Engineered Materials Arresting System
- New Runway Pavement

Note:
1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.

Acronyms and Abbreviations:
ASDA = Accelerate Stop Distance Available
LDA = Landing Distance Available
RSA = Runway Safety Area
Rwy = Runway
TODA = Takeoff Distance Available
TORA = Takeoff Run Available

0 450 900 FEET

PROPOSED ACTION - LAYOUT PLAN - RUNWAYS 1R-19L AND 1L-19R

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-11

Sources:
Top: Engineered Arresting Systems Corporation
Bottom: Yeager Airport, Charleston, West Virginia

**SAMPLE INSTALLATIONS –
ENGINEERED MATERIALS ARRESTING SYSTEM**

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 1-12

11/28/11 vsa/hk ...T:\SFO RSA\EA Jun11\Fig1-12_sample EMAS.ai

as part of the RSA. Declared distances proposed as part of the SFO RSA Program include Takeoff Run Available (TORA), Takeoff Distance Available (TODA), Accelerate Stop Distance Available (ASDA), and Landing Distance Available (LDA). A detailed description of airfield characteristics, including declared distances, is provided in **Appendix B1** of this EA.

The SFO RSA Program also includes a number of related components such as demolition and relocation of an existing electrical substation building, new underground drainage installations and pump stations, relocation of runway and taxiway lights and signage, and modifications to existing navigation aids.

While not part of the SFO RSA Program, installation of Runway Status Lights (RWSL) overlaps with the proposed construction schedule of the RSA Program, and are therefore included with the Proposed Action. RWSLs are lights embedded in the runway and taxiway pavement that provide visual warnings to pilots when it is unsafe to cross runways and taxiways. The purpose of and design requirements for RWSLs are detailed in FAA AC 150/5340-30E, *Design and Installation Details for Airport Visual Aids* (FAA, 2010c). For example, the red takeoff hold lights are illuminated if the runway is unsafe for departures. There are three types of RWSLs that would be installed: runway-entrance hold lights (RELs), take-off hold lights (THLs), and runway intersection lights (RILs). These lights would be installed at all runway ends, associated taxiways, and intersection points.

1.3.1 RUNWAYS 10L-28R AND 10R-28L

The primary components of the RSA enhancements to Runways 10L-28R and 10R-28L associated with the Proposed Action include:

East End (Figure 1-6)

- Displace the landing thresholds for Runways 28L and 28R by 300 feet to the west to provide 600 feet of RSA prior to the landing thresholds.
- Relocate glide slope navigation aids, associated 600-gallon underground fuel tank for the glide slope antennas, and portions of the approach lighting system installations for Runways 28L and 28R to accommodate the relocated landing thresholds.
- Install Runway Status Lights.

West End (Figure 1-7)

- Relocate the west end of the Runway 10R-28L pavement by 781 feet west to preserve the existing Runway 10R takeoff capability and stagger of parallel runway thresholds.
- Relocate the existing localizer antenna to the west for arrivals on Runway 28L.
- Construct a new taxiway connection between Taxiway S, the relocated threshold of Runway 10R, and Taxiway Z.
- Install Runway Status Lights.

Declared Distances (Figure 1-8)

- Implement Declared Distances (shown in feet) for Runways 10L-28R and 10R-28L:

Runway	10L	28R	10R	28L
ASDA	11,203	11,880	10,704	10,981
LDA	11,203	11,580	10,704	10,681
TORA	11,880	11,880	11,381	10,981
TODA	11,880	11,880	11,381	10,981

1.3.2 RUNWAYS 1L-19R AND 1R-19L

The primary components of the RSA enhancements to Runways 1L-19R and 1R-19L associated with the SFO RSA program include:

Runway Shifts (Figures 1-9 and 1-10)

- Shift Runway 1L-19L by approximately 200 feet to the south by extending the runway pavement at the south end of the runway by approximately 205 feet and reducing the north end of the runway by a similar distance, thus providing a 446-foot-long by 500-foot-wide RSA prior to the Runway 19L landing threshold while maintaining the existing runway length.

- Shift Runway 1L-19R by approximately 450 feet to the south by extending the runway pavement at the south end of the runway by approximately 450 feet and reducing the north end of the runway by a similar distance, thus providing a 600-foot-long by 500-foot-wide RSA prior to the Runway 19R landing threshold while maintaining the existing runway length.

North End (Figure 1-9)

- Construct a nonstandard EMAS bed approximately 550 feet long and 220 feet wide north of the Runway 19R threshold, with a 50-foot setback from the runway end.

- Construct a nonstandard EMAS bed approximately 410 feet long and 220 feet wide north of the Runway 19L threshold, with a 35-foot setback from the runway end.

- Decommission or demolish the existing pavement of Taxiway E and Taxiway L and replace/ realign the taxiways to provide access to the relocated threshold of Runways 19L and 19R.

- Relocate portions of the approach lighting for Runway 19L to accommodate the relocated landing threshold.

- Install Runway Status Lights.

South End (Figure 1-10)

- Construct a nonstandard EMAS bed approximately 500 feet long and 220 feet wide south of the Runway 1L threshold, with a 35-foot setback from the runway end.

- Construct a nonstandard EMAS bed approximately 380 feet long and 220 feet wide south of the Runway 1R threshold, with a 35-foot setback from the runway end.
- Decommission the majority of the existing Taxiway A and A1 pavement and construct a realigned Taxiway A extending (between Taxiway B and Taxiway L) around the south side of the new EMAS installations at the south end of the runways.
- Construct a new taxiway between Taxiway B, Runway 1L threshold, Runway 1R threshold, and Taxiway L, with a midfield connection to the realigned Taxiway A.
- Realign the airport operating area fence and blast fence to an area south of realigned Taxiway A, which would include constructing a new box culvert over the Millbrae Highline Canal for a taxiway shoulder and realigned vehicle service road, blast fence, and airport operating area fence.
- Fill and/or reconfigure the South Detention Basin, South Oxidation Pond, Bird Ball Ditch, and associated stormwater ponds for construction of the new realigned taxiways; install new stormwater drains and a new pump station, replace stormwater outfall pipe; realign an existing vehicle service road; relocate an existing electrical substation; and modify existing navigation aids.
- Install Runway Status Lights.

Declared Distances (Figure 1-11)

- Implement Declared Distances (shown in feet) for Runways 1L-19R and 1R-19L:

Runway	1L	19R	1R	19L
ASDA	7,500	7,500	8,650	8,650
LDA	7,440	7,500	8,550	8,650
TORA	7,500	7,500	8,650	8,650
TODA	7,500	7,500	8,650	8,650

1.4 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.4.1 SPONSOR'S PURPOSE AND NEED

The purpose of the SFO RSA Program is to enhance the level of safety provided by RSAs at the Airport to comply with standards included in FAA AC 150/5300-13, *Airport Design,* as required by P.L. 109-115, or provide an equivalent level of safety in accordance with FAA Orders 5200.8, *Runway Safety Area Program,* and 5200.9, *Financial Feasibility and Equivalency of RSA Improvements and EMAS* (FAA, 2006b). The FAA's design standards were established to ensure the safety of airports. These standards include criteria for RSAs, which are clear and graded areas around a runway, free of objects and structures. RSAs are designed and maintained to enhance safety in the event that an aircraft undershoots, overruns, or veers off the runway, and to provide greater accessibility for firefighting and rescue equipment during such incidents. RSAs should also be adequately drained by surface grades or storm sewers to prevent water accumulation.

The applicable requirements for RSAs are included in Table 3-3 of FAA AC 150/5300-13, *Airport Design*. Both the Airplane Design Group (ADG), defined by an aircraft's wingspan, and the Aircraft Approach Category, defined by an aircraft's approach speed, form the basis for establishing RSA dimensions. However, for Approach Category C aircraft (which generally include narrow-body jet aircraft such as the Boeing 737) and Approach Category D aircraft (which generally include wide-body jet aircraft such as the B747-400), RSA dimensions are constant regardless of ADG. Based on these criteria, the following standard RSA dimensional requirements outlined below apply to SFO:

RSA Dimensions	Approach Category C and D (feet)
RSA Width	500
RSA Length Prior to Landing	600
RSA Length Beyond the Runway	1,000

Because all runways at SFO can be used in either direction depending on wind conditions, the 1,000-foot RSA extending from both ends of each runway is applicable.

Many airports were built before the current FAA design standards for RSAs were adopted. Achieving the required RSAs can be challenging due to such obstacles as water bodies, highways, or populated areas. In the late 1990s and early 2000s, a series of aircraft mishaps resulted in the loss of human life and highlighted the need for airports to comply with RSA standards. These accidents, such as those in Little Rock, Arkansas, and Chicago, Illinois, stimulated the passage of P.L. 109-115, which states that "*not later than December 31, 2015, the owner or operator of an airport certificated under 49 United States Code 44706 shall improve the airport's RSAs to comply with the FAA design standards required by 14 Code of Federal Regulations Part 139*" (P.L. 109-115, November 30, 2005 [119 Statute 2401]).

While not part of the SFO RSA Program, installation of RWSLs overlaps with the proposed construction schedule of the RSA Program, and is therefore included with the Proposed Action. The purpose of and design requirements for RWSLs are detailed in FAA AC 150/5340-30E, *Design and Installation Details for Airport Visual Aids* (FAA, 2010c).

1.4.2 FAA Purpose and Need

The proposed SFO RSA Program is not a capacity-enhancing project, and would not result in any associated increase or decrease in aviation activity at the Airport. The FAA's statutory mission is to ensure the safe and efficient use of navigable airspace in the United States. Under FAA Order 5200.8, *RSA Program*, the FAA is directed to implement the RSA Program, which is intended to provide enhanced safety through the establishment of RSAs at all public use airports. Implementation of the Proposed Action at SFO would result in compliance with the design standards set forth in FAA AC 150/5300-13, to the extent practicable.

1.5 REQUESTED FEDERAL ACTIONS

The requested FAA actions include the following:

- Unconditional approval of the portion of the Airport Layout Plan that depicts the proposed RSA Program and installation of in-pavement RWSLs to the taxiways adjacent to the runways to meet FAA Airport Design Standards while the RSA Program is under construction;
- Implementation of revised air traffic control procedures below 3,000 feet above ground level;
- Establishment of new Standard Instrument Departure and Standard Terminal Arrival Route procedures;
- Determinations under 49 United States Code (U.S.C.) §§ 47106 and 47107 relating to the eligibility of the Proposed Action for federal funding under the Airport Improvement Program;
- Establishment of flight procedure modifications pursuant to 14 CFR Part 95, *IFR Altitudes*;
- Installation, relocation, operation, and maintenance of navigational aids required to support the Proposed Action by FAA Air Traffic Organization;
- Processing of airspace changes, installation, and/or relocation of FAA equipment (e.g., Instrument Landing System, Approach Lighting System, and RWSLs);
- Close coordination with the Airport by appropriate FAA program offices, as required, to maintain aviation and airfield safety during construction pursuant to 14 CFR Part 139 under 49 U.S.C. § 44706;
- Approval of the appropriate amendments to the Airport Certification Manual pursuant to 14 CFR Part 139;
- Appropriate amendment to air carrier operations specifications pursuant to 49 U.S.C. § 44705 to account for the change in runway ends and installation of EMAS, as appropriate; and
- FAA determination of the Proposed Action's effects on the safe and efficient use of airspace.

1.6 PRELIMINARY SFO RSA PROGRAM SCHEDULE

Construction of the RSA enhancements outlined in Sections 1.3.1 and 1.3.2 are expected to be constructed between 2012 and 2015 to comply with the December 31, 2015, deadline established by P.L. 109-115.

1.7 DOCUMENT ORGANIZATION

The contents of each section of this EA are summarized below.

- **Chapter 1**, Purpose and Need, provides a brief description of SFO and the Proposed Action, its purpose, and why it is needed.

- **Chapter 2**, Alternatives, provides an overview of the identification and screening of alternatives considered as part of the environmental evaluation process.

- **Chapter 3**, Affected Environment, describes existing environmental conditions within the project study area.

- **Chapter 4**, Environmental Consequences and Mitigation, discusses and compares the environmental impacts associated with the Proposed Action, the No Action Alternative, and mitigation options considered.

- **Chapter 5**, Coordination and Public Involvement, discusses the coordination and public involvement associated with the EA process. This section also presents a list of federal, state, and local agencies and other interested parties that have been involved in EA coordination efforts.

- **Chapter 6**, List of Preparers.

- **Chapter 7**, References.

- **Chapter 8**, List of Abbreviations and Acronyms.

- The **appendices** contain various reference materials, including technical information, and records of coordination activities.

CHAPTER 2.0
ALTERNATIVES

2.1 INTRODUCTION

2.1.1 SCOPE OF THE ALTERNATIVES ANALYSIS

This chapter summarizes the screening analysis conducted to identify the range of reasonable and practicable alternatives that were considered and selected for full evaluation in this Environmental Assessment (EA). This summary of the alternatives analysis presents the following:

- An overview of the structure of the alternatives analysis used for this EA;
- A description of all alternatives considered, including the Proposed Action and the No Action alternatives;
- A concise statement explaining why some alternatives considered have been eliminated from further study; and
- A listing of applicable laws, regulations, executive orders and associated permits, licenses, and/or reviews.

2.1.2 REQUIREMENTS OF THE NATIONAL ENVIRONMENTAL POLICY ACT

The Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] Part 1502.14) for implementing the National Environmental Policy Act of 1969 (NEPA) require that federal agencies perform the following tasks:

- Rigorously explore and objectively evaluate all reasonable alternatives and, for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated;
- Devote substantial treatment to each alternative considered in detail, including the Proposed Action, so that reviewers may evaluate their comparative merits;
- Include reasonable alternatives not within the jurisdiction of the lead agency; and
- Include the alternative of no action.

The stated purpose and need for the improvements to Runway Safety Areas (RSAs) at San Francisco International Airport (SFO or the Airport) is to provide RSAs that meet Federal Aviation Administration (FAA) design standards consistent with FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, as required under Public Law (P.L.) 109-115, or provide an equivalent level of safety in accordance with FAA Orders 5200.8, *Runway Safety Area Program,* and 5200.9, *Financial Feasibility and Equivalency of RSA Improvements and EMAS*. RSAs are defined and standard RSA dimensional requirements are included in Chapter 3 and Table 3-3 of FAA AC 150/5300-13 and have been described in **Section 1.2.2** of this EA. Reasonable alternatives that accomplish the stated purpose and need for the project have been identified and evaluated in this EA to satisfy NEPA requirements.

2.1.3 ALTERNATIVES SCREENING PROCESS OVERVIEW

The evaluation of alternatives for this EA is based primarily on information developed in two recently completed RSA planning studies prepared for the Airport:

- *Runway Safety Area Study for Runways 1R-19L and 1L-19R*, August 2010, and
- *Runway Safety Area Study for Runways 10L-28R and 10R-28L*, August 2010.

These studies were developed by an RSA Study Working Group convened by the Airport to ensure that the needs of the various airport users were considered. The group was tasked with providing input on the various RSA alternatives developed for the planning studies. The working group evaluated the merits of the RSA alternatives presented, and assisted in the determination of the preferred RSA alternatives.

The subsequent evaluation of alternatives for this EA was conducted using the three-step process that is presented on **Figure 2-1**. A detailed description of the evaluation criteria used in this process is included in **Section 2.2**. As shown on **Figure 2-1**, each alternative was first evaluated to determine whether it would meet the purpose of and need for the Proposed Action by enhancing the Airport's RSAs, consistent with FAA AC 150/5300-13, *Airport Design*. A detailed description of the evaluation criteria used in this three-step process is provided in **Section 2.2**.

Each alternative found to meet the Step 1 criterion was then evaluated in Step 2 to determine whether it would be practicable and consistent with FAA Order 5200.8, *Runway Safety Area Program*, considering existing technology and logistics in light of the overall project purpose, including implementation and completion by December 31, 2015, as specified in P.L. 109-115.

In Step 3, alternatives that were found to meet both the Step 1 and Step 2 criteria were further evaluated to determine whether each would result in a safe and efficient use of navigable airspace, and would minimize impacts on existing operations at the airfield.

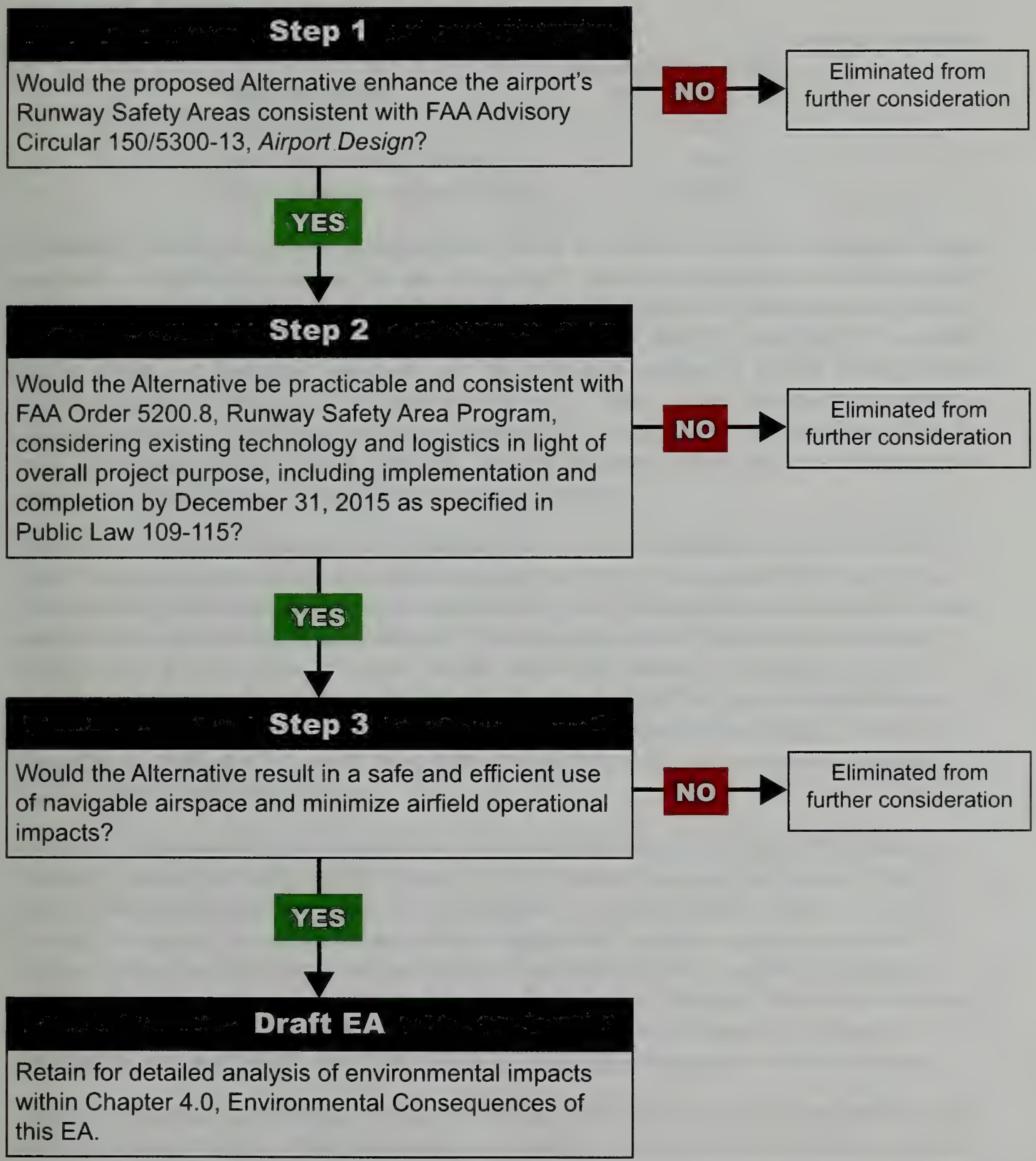
The alternatives that were found to meet all the criteria of this three-step process were, along with the No Action Alternative, carried forward for evaluation of potential environmental effects, as described in Chapter 4.0 of this EA.

2.2 ALTERNATIVES EVALUATION CRITERIA

2.2.1 STEP 1 CRITERIA – PURPOSE AND NEED

The criterion for the Step 1 analysis was whether an alternative would improve the Airport's RSAs to comply with the FAA design standards required by 14 CFR Part 139, and articulated in FAA AC 150/ 5300-13, *Airport Design*.

Table 3-3 of the FAA AC includes the required RSA dimensions for an airport such as SFO, serving large commercial aircraft in Approach Categories C and D, which are listed below. Chapter 1 of the FAA AC defines aircraft Approach Categories A to E, which represent groupings of aircraft based on 1.3 times their stall speed in their landing configuration at the certificated maximum flap setting and maximum landing weight, under standard atmospheric conditions.



ALTERNATIVES SCREENING PROCESS

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-1

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RSA Dimensions	Approach Category C and D (feet)
RSA Width	500
RSA Length Prior to Landing	600
RSA Length Beyond the Runway	1,000

As defined in Chapter 1 of FAA AC 150/5300-13, an RSA is "an identified surface surrounding the runway prepared and suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." Chapter 3 of FAA AC 150/5300-13 includes clearing, grading, and drainage requirements for RSAs. Terrain must be capable, under dry conditions, of supporting aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft. The RSA must be free of objects, except for those that are fixed in place by their function, such as lighting and navigational aids. Objects more than 3 inches above grade must be frangible-mounted (capable of breaking off easily on impact) structures of the lowest practical height, with the frangible point no higher than 3 inches above grade.

When it is impracticable to establish an RSA meeting the standard dimensions in FAA AC 150/5300-13, *Airport Design,* an airport sponsor may decide to improve the RSA to meet current FAA Airport Design Standards using an Engineered Material Arresting System (EMAS) located beyond the end of the runway and centered on the extended runway centerline. Use of standard length EMAS designed to stop the design aircraft[1] at an exit speed of 70 knots, coupled with the approach end of the runway providing vertical guidance (visual or electronic) for landing aircraft and having 600 feet of graded safety area on the approach end of the runway, meets the current FAA design standards. (See FAA AC 150/5300-13, Airport Design, Tables 3-1, 3-2, and 3-3, and FAA AC 150/5220-22A *Engineered Materials Arresting Systems [EMAS] for Aircraft Overruns.*)

An EMAS is a specialized system installed in the RSA beyond the runway end, made of high energy absorbing materials such as crushable concrete. EMAS is designed to stop an overrunning aircraft by exerting predictable deceleration forces on its landing gear as the EMAS material crushes. It must be designed to minimize the potential for structural damage to aircraft, since such damage could result in injuries to passengers and/or affect the predictability of deceleration forces. The EMAS must have the ability to decelerate the design aircraft exiting the end of the runway at 70 knots. The runway must also provide either instrument or visual vertical guidance for approaches to the runway in the opposite direction (i.e., the direction where the EMAS installation would be at the approach end of the runway).

FAA AC 150/5220-22A states that an EMAS is located beyond the end of the runway and centered on the extended runway centerline. It will usually begin at some setback distance from the end of the runway to avoid damage due to jet blast and undershoots. This distance will vary depending on the available area and the EMAS materials. Where the area available is longer than required for installation of a standard EMAS designed to stop the design aircraft at an exit speed of 70 knots, the EMAS should be placed as far from the runway end as practicable. Such placement decreases the possibility of damage to the

[1] The FAA defines the design aircraft as an aircraft having at least 500 operations on the runway, and having the most demand on the EMAS. This is usually, but not always, the heaviest aircraft that regularly uses the runway.

system from short overruns or undershoots and results in a more economical system by considering the deceleration capabilities of the existing runway safety area.

The resulting RSA must provide adequate protection for aircraft that touch down prior to the runway threshold (undershoot). Adequate protection is provided by either: (1) providing at least 600 feet (or the length of the standard runway safety area, whichever is less) between the runway threshold and the far end of the EMAS bed if the approach end of the runway has vertical guidance, or (2) providing the full length standard runway safety area when no vertical guidance is provided.

2.2.2 Step 2 Criteria – Practicability and Implementation Schedule

The criteria used in the Step 2 evaluation addressed several key considerations:

- Could the alternative realistically be developed and implemented by December 31, 2015, as specified in P.L. 109-115?
- Would the alternative be practicable and prudent, considering existing technology, as well as design and construction challenges and potential costs when compared to other alternatives?
- Does the alternative provide the maximum practicable benefit to aviation safety in accordance with the guidance in FAA Order 5200.8, *Runway Safety Area Program*, Appendix 2?

2.2.2.1 Implementation Schedule

The ability to successfully plan, design, obtain necessary permits for, and construct each alternative by the December 31, 2015, deadline established by P.L. 109-115 is a key criterion in this step of the evaluation process. Timely implementation of some alternatives could not be achieved due to the time required to develop designs and environmental documentation and to obtain required permits. The likely time needed to gain approvals for any substantial fill in San Francisco Bay (SF Bay) or relocation of U.S. Highway 101 (U.S. 101) is more than the City and County of San Francisco (CCSF) has to meet the P.L. 109-115 deadline.

2.2.2.2 Construction and Cost Practicability

These criteria addressed the relative engineering design and construction complexity of each alternative, along with the projected cost of both construction and environmental mitigation requirements. As an example, the requirement to relocate a major transportation facility such as U.S. 101, including the necessary maintenance of traffic operations during construction, would pose substantial design and construction challenges. Similarly, the requirement to design, permit, and construct a major area of fill in the SF Bay would pose both substantial construction challenges and substantial costs for both construction and required mitigation activities. Alternatives that included either of these activities would be considered less practical and more costly than other alternatives.

2.2.2.3 Provision of Maximum Practical Benefit to Aviation Safety

An explicit goal of FAA Order 5200.8, *Runway Safety Area Program,* is to encourage airports to provide the maximum practical benefit to aviation safety in developing their RSA program, when provision of

standard RSAs specified in FAA AC 150/5300-13, *Airport Design,* is not practical. The order recommends consideration of a sequence of possible improvements, as listed in **Section 2.2.1**, and recommends that for each alternative improvement the greatest practical conformance with the standard RSA dimensions and/or performance (for installations such as EMAS) be implemented.

2.2.3 Step 3 Criteria – Safe and Efficient Use of Navigable Airspace and Impact on Airfield Operations

The final step of the evaluation process considered these two criteria:

- Is the alternative consistent with the FAA's statutory mission to ensure the safe and efficient use of navigable airspace?
- Would the alternative minimize the impact of the RSA improvements on the operation of the Airport, including the ability to effectively serve the aircraft fleet currently using and expected to use the Airport?

2.2.3.1 Safe and Efficient Use of Navigable Airspace

The first Step 3 criterion involved evaluation of whether an alternative reaching the Step 3 evaluation would enhance or degrade the ability of the FAA to maintain and use acceptable airspace procedures, ensuring the safe and efficient operation of aircraft in arriving at or departing the Airport. This criterion considered whether the alternative would require significant changes to either local or regional airspace procedures, as well as potential conflicts with operations associated with other airports in the region.

2.2.3.2 Airport Operations

The second Step 3 criterion involved evaluation of whether, and to what extent, an alternative would reduce the efficiency of existing operations at the Airport. Examples of such impacts would be increases in taxi distances and times, and increased delays due to the need for aircraft to cross active runways. Of particular importance under this criterion was the impact an alternative would have on the maximum gross takeoff weight (MGTOW) and payload of specific key aircraft in common use at the Airport.

2.3 EVALUATION OF OFF-AIRPORT AND NON-STRUCTURAL ALTERNATIVES

2.3.1 Use of Alternative Modes of Transportation

The purpose of the Proposed Action is to enhance aviation safety by providing RSAs at SFO that meet FAA design standards consistent with FAA AC 150/5300-13, *Airport Design*, as required by P.L. 109-115. The use of alternative modes of transportation to replace some or all of the air transportation activity at SFO does not meet this purpose because the RSAs at SFO would still not meet applicable FAA standards, and safety would not be enhanced, as required by P.L. 109-115. In addition, FAA and CCSF do not have the authority to compel SFO airport users to use other modes of transportation. This alternative was, therefore, eliminated from further consideration in this EA.

2.3.2 *Use of Other Area Public Airports*

The purpose of the Proposed Action is to enhance aviation safety by providing RSAs at SFO that meet FAA design standards consistent with FAA AC 150/5300-13, *Airport Design*, as required by P.L. 109-115. The use of other area public airports to replace some or all of the air transportation activity at SFO does not meet this purpose because the RSAs at SFO would still not meet applicable FAA standards, and safety would not be enhanced, as required by P.L. 109-115. In addition, FAA and CCSF do not have the authority to divert air transportation activity from SFO to other area airports. This alternative was, therefore, eliminated from further consideration in this EA.

2.3.3 *Use of Alternative Aircraft*

The purpose of the Proposed Action is to enhance aviation safety by providing RSAs at SFO that meet FAA design standards consistent with FAA AC 150/5300-13, *Airport Design*, as required by P.L. 109-115. The use of alternative aircraft to replace some or all of the air transportation activity at SFO does not meet the purpose and need of the project because the RSAs at SFO would still not meet applicable FAA standards, and safety would not be enhanced, as required by P.L. 109-115. In addition, FAA and CCSF do not have the authority to compel airlines to use alternative aircraft. This alternative was, therefore, eliminated from further consideration in this EA.

2.4 *DESCRIPTION OF BASIC ON-FIELD ALTERNATIVES*

This section includes a description of basic concepts for correcting RSA deficiencies that are established in FAA Order 5200.8, *RSA Program* and FAA AC 150/5220-22A, *Engineered Materials Arresting Systems for Aircraft Overruns*. In cases where regular RSA dimensional standards may not be practicable, alternatives for improving RSAs to the extent practicable have been developed, considering the predominant direction of runway use and other aircraft operational considerations, site constraints, environmental considerations, and implementation costs.

2.4.1 *Construct Standard Runway Safety Areas*

The first design concept for establishing an RSA that meets the current standards is to consider creating, improving, and/or grading of a safety area of standard RSA dimensions surrounding the runway (see **Section 2.2.1** above). At a minimum, land acquisition, fill requirements, soil improvement requirements, and grading requirements must be identified and evaluated. This alternative often involves the greatest unavoidable impacts on natural resources and surrounding communities, and therefore, the greatest potential costs for environmental mitigation.

2.4.2 *Relocate, Shift, or Realign the Runways*

One method of obtaining standard RSA dimensions involves relocating, shifting, realigning, or otherwise changing a runway. In some cases the environmental impacts and construction/implementation costs of these types of RSA improvements may not be practicable.

2.4.3 Reduce Runway Lengths

Under this alternative, standard RSA dimensions may be obtained by shortening the length of runways to achieve the required RSA length. This may be feasible where the current design aircraft require less runway length than what is currently available, or where the runway length and/or RSA requirements for a particular runway may be reduced by diverting larger aircraft to other runways at the Airport without impacting airport operations.

2.4.4 Implement Declared Distances

Where it is impracticable to provide the clearances and dimensions for RSAs to meet FAA design standards, another acceptable means of creating an equivalent RSA is by using declared distances. Declared distances are defined in Chapter 1 of AC 150/5300-13, *Airport Design*, as "the distances the Airport operator declares available and suitable for satisfying an aircraft's takeoff run, takeoff distance, accelerate-stop distance, and landing distance requirements." Typically, this concept involves declaring that some portion of the existing runway pavement is unavailable for specific operations, and is instead used to provide an RSA meeting applicable FAA design standards. Declared distances are also used where different runway lengths are defined for each direction of operation (i.e., when displaced thresholds are present). Pilots use these declared distances, along with weather data and aircraft performance characteristics, to make determinations such as the maximum allowable takeoff or landing weight of the aircraft or the maximum payload and range for a flight. Further descriptions of declared distances are included in **Section 1.3** and **Appendix B1** of this EA. Declared distances at airports are considered in the Operations Specifications of commercial aircraft operators that are part of the air carrier certificates and operations certificates issued by FAA under 14 CFR Part 119, as well as in the internal operations manuals of those operators. Pilots of commercial aircraft are required to comply with such specifications and manuals.

In this situation, the specified distance available for a particular operation such as landing may be different in each direction on the same runway pavement.

Declared distances proposed as part of the RSA Improvement Program include Takeoff Run Available (TORA), Takeoff Distance Available (TODA), Accelerate Stop Distance Available (ASDA), and Landing Distance Available (LDA). Implementation of declared distances requires coordination with airport users and FAA approval. More detailed descriptions of the requirements for these declared distances are provided in **Appendix B1**.

2.4.5 Install Standard Engineered Materials Arresting Systems

When it is not practicable to create an RSA that meets applicable FAA standards, consideration may be given to enhancing the safety of the area beyond the runway end with the installation of an EMAS. An EMAS is a specialized system installed in the RSA beyond the runway end, made of high-energy-absorbing materials. When an aircraft overruns the runway, these materials are crushed, absorbing the forward momentum of the aircraft and decelerating and arresting the aircraft's movement. The FAA requires that EMAS be engineered to decelerate the runway's design aircraft at exit speeds of 70 knots, without causing significant damage to the aircraft or injuries to the passengers. Section 4 of FAA AC 150/5220-22A,

Engineered Materials Arresting Systems for Aircraft Overruns, indicates that a standard EMAS provides a level of safety that is generally equivalent to a full RSA built to the dimensional standards in FAA AC 150/5300-13, *Airport Design*. For purposes of installing an EMAS, the FAA defines the design aircraft as an aircraft having at least 500 annual operations (takeoffs and landings) on the runway, and having the most demand on EMAS. This is usually, but not always, the heaviest aircraft that regularly uses the runway. According to FAA Order 5200.8, the standard EMAS bed length for the design aircraft at SFO is between 500 feet and 600 feet. For purposes of the RSA studies for SFO, the standard EMAS bed length was assumed to be 550 feet and would be refined during the detailed design phase of the SFO RSA Program. A photograph of an EMAS installation is provided on **Figure 1-12**. The dimensions of standard EMAS installations are shown in several figures in this section, including **Figure 2-7**.

Section 8.6 of FAA AC 150/5220-22A indicates that when there is insufficient RSA available for a standard EMAS, the EMAS must be designed to achieve the maximum deceleration of the design aircraft within the available RSA.

2.5 DESCRIPTION AND EVALUATION OF BASIC ON-AIRPORT ALTERNATIVES

2.5.1 RUNWAYS 10L-28R AND 10R-28L

2.5.1.1 Construct Standard Runway Safety Areas

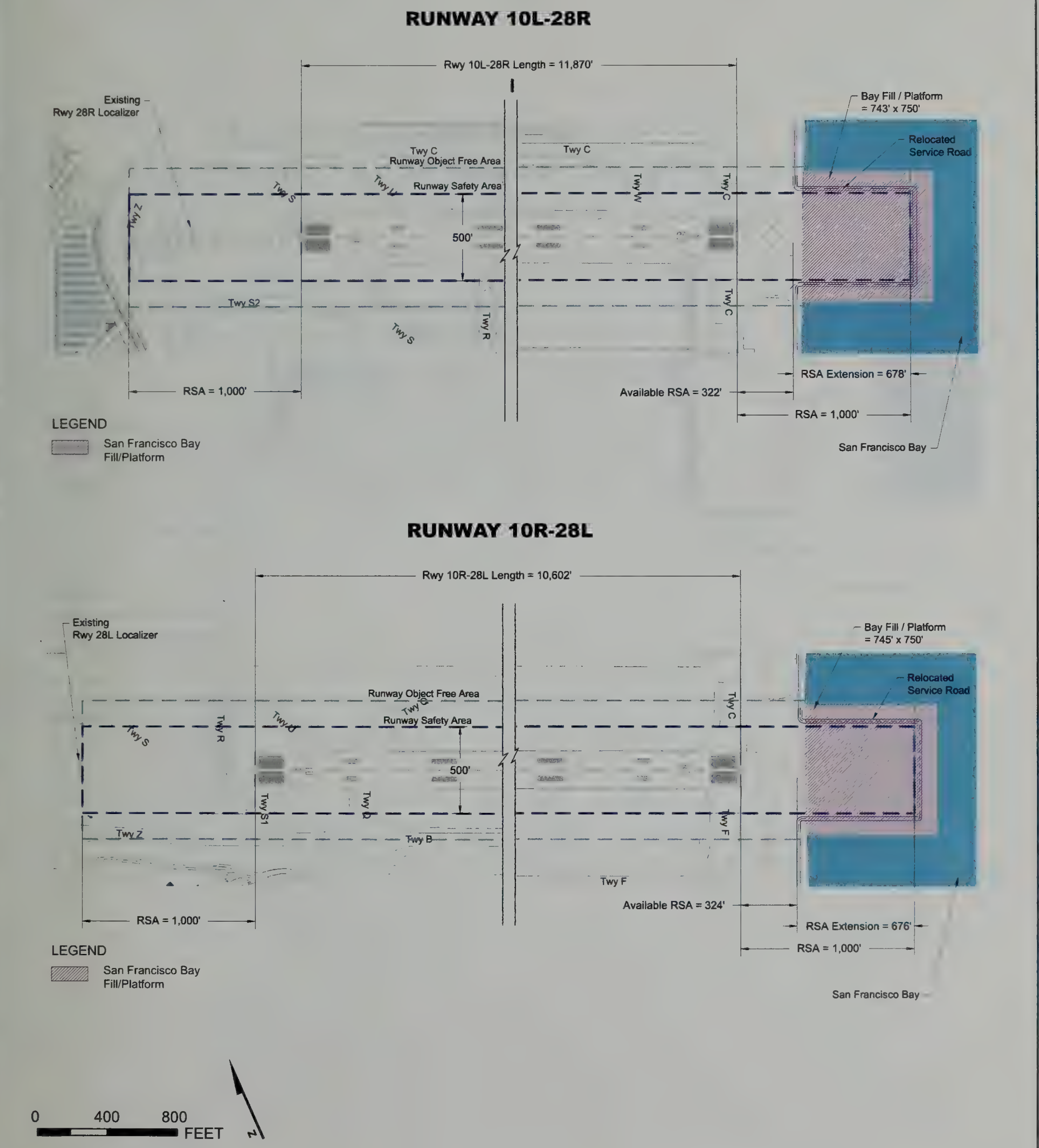
A standard 1,000-foot RSA already exists at the Runway 10L and 10R approach (western) ends. The RSA currently available on the Runway 28R approach (eastern) end is 322 feet long, and the current available RSA on the Runway 28L approach (eastern) end is 324 feet. As illustrated on **Figure 2-2**, constructing a standard RSA on the ends of Runways 28R or 28L while retaining the existing runway length would require filling approximately 13 acres of the SF Bay, or installing a platform approximately 750 by 750 feet in the SF Bay capable of supporting the weight of an aircraft. The total incursion into the SF Bay for both runways would be approximately 26 acres of fill or platform area. This concept would also require realigning the service road east of the Runway 28L and 28R ends, and relocating the Runway 28L Medium-Intensity Approach Lighting System with Runway Alignment Indicator.

Evaluation

Construction of standard RSAs at both ends of Runways 10L-28R and 10R-28L without other changes to the runways or their use would meet the Step 1 criterion of providing RSAs that conform to applicable FAA design standards. Because the SF Bay fill or platform concept would require extensive environmental analysis, permitting, and approval processes prior to the start of construction, it did not meet the Step 2 criteria of project completion by the end of 2015. This alternative was, therefore, eliminated from further consideration for Runways 10L-28R and 10R-28L in this EA.

2.5.1.2 Relocate, Shift, or Realign the Runways

Due to the physical site constraints of the Airport, such as the proximity to the SF Bay and the existing terminal complex, realigning Runways 10L-28R and 10R-28L is not feasible. As shown on **Figure 2-3**, this alternative would shift Runway 10L-28R west 678 feet and Runway 10R-28L 676 feet to the west; would require new



Acronyms and Abbreviations:

RSA Runway Safety Area
Twy Taxiway

Source:
R&A (2010a), Exhibits 4-1 and 4-5 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

RUNWAYS 10L-28R AND 10R-28L CONSTRUCT STANDARD RUNWAY SAFETY AREAS ALTERNATIVE

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FIGURE 2-2

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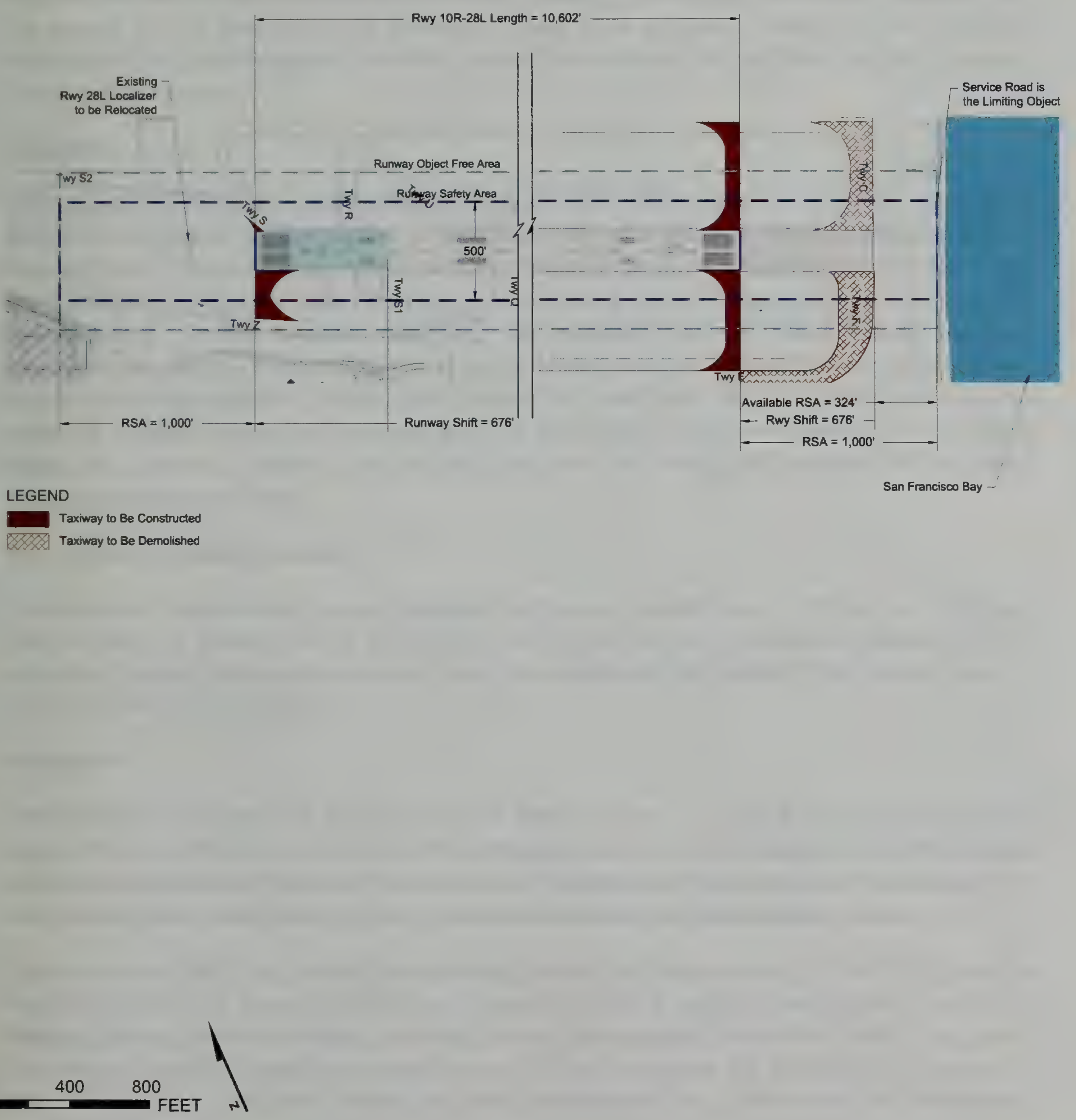
RUNWAY 10R-28L



Acronyms and Abbreviations:
RSA Runway Safety Area
Twy Taxiway

Source:
R&A (2010a), Exhibit 4-6 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

RUNWAY 10R-28L
RELOCATE, SHIFT, OR REALIGN THE RUNWAYS ALTERNATIVE

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-3

11/28/11 vsa/hk ...T:\SFO RSA\EA Jun11\Fig2-3_10-28 relocate.ai

runway pavement at the western ends of both runways; and would provide a standard 1,000 feet of longitudinal RSA beyond the eastern threshold of each runway. To maintain standard RSAs at the western end, this concept would require relocating a portion of Taxiway Z, the Runway 28R localizer, the service road, the parking lot, the blast fence, the Runway 28L glide slope antennae, Taxiways C and F, and the Runway 10R glide slope antennae. Additionally, the exit taxiway layout may need to be modified to maintain runway occupancy times.

Evaluation

The Runway Shift alternative would meet the purpose and need criterion of Step 1. Although new taxiways and other modifications would be required as described above, there would be no significant impediments to the construction of this alternative. The RSA Study Working Group found that the development cost of this concept would likely be significantly higher than the Implement Declared Distances alternative discussed in **Section 2.5.1.4**. It was, therefore, determined that although it met the Step 2 criterion regarding implementation schedule, it was not practical to pursue further, given cost considerations. In addition, airline representatives indicated that if either runway were to be shifted west, departure performance could be negatively impacted because the runway(s) would be moved closer to terrain features such as Sweeney Ridge with a summit of 1,200 feet and San Bruno Mountain. As a result, this alternative was not carried forward for evaluation in this EA.

2.5.1.3 Reduce Runway Lengths

This alternative would involve reducing the length of Runway 10L-28R from 11,870 feet to 11,192 feet; and the length of Runway 10R-28L from 10,602 feet to 9,926 feet, as illustrated on **Figure 2-4**. The abandoned portions of the runways would allow the establishment of standard RSAs at either ends of Runways 10R-28L and 10L-28R.

Evaluation

This alternative would meet the purpose and need criterion of Step 1. Although new taxiways would be required to connect the new runway ends to the parallel taxiways, and several navigation and lighting facilities would have to be relocated, there would be no significant impediments to the construction of this alternative. It was, therefore, determined to meet the Step 2 criteria of practicability and implementation schedule.

Data used in the RSA Study suggest that the design aircraft for these runways (B747-400ER) would be capable of landing on Runway 10R-28L and Runway 10L-28R at maximum landing weight under the Reduce Runway Lengths Alternative. However, the data also suggest that the B747-400ER may not be operationally capable of departing on either Runway 10R-28L or Runway 10L-28R at MGTOW under this alternative, depending on certain aircraft and airfield characteristics (e.g., engine type, field temperature, and payload range).

The consensus of the RSA Study Working Group was that the Reduce Runway Length concept would be unacceptable to the airline users, and not viable, because the effective departure length of the Airport's longest runway (Runway 10L-28R) would be reduced from 11,870 feet to 11,192 feet. Additionally, the effective departure length for Runway 10R-28L would be reduced from 10,602 feet to 9,926 feet. Based

on airplane manufacturer's data, the Reduce Runway Length concept would likely reduce payloads depending on aircraft and runway used. Airline representatives indicated that the reduced runway lengths would have a negative impact on their passenger and cargo operations to certain markets.

For these reasons, the alternative of simply shortening Runways 10L-28R and 10R-28L to provide standard RSAs was not carried forward for evaluation in this EA.

2.5.1.4 Implement Declared Distances/Implement Declared Distances and Shift Runway

Figure 2-5 depicts the Implement Declared Distances concept for Runway 10L-28R. The 1,000-foot RSA currently located beyond the western end of the Runway 10L-28R satisfies the requirements of the RSA standards; as a result, the Runway 10L landing threshold would remain unchanged. The Runway 10L TORA and TODA would extend to the full length of the runway; however, the Runway 10L ASDA and LDA would be declared to provide a 1,000-foot safety distance to the service road (which is a limiting obstacle). Additionally, the Runway 28R landing threshold would need to be relocated a minimum of 278 feet west to provide a 600-foot RSA prior to the landing threshold. Runway 28R departures would begin the takeoff roll at the physical runway end (existing threshold). As a result, the following declared distances would apply under the original concept for this alternative:

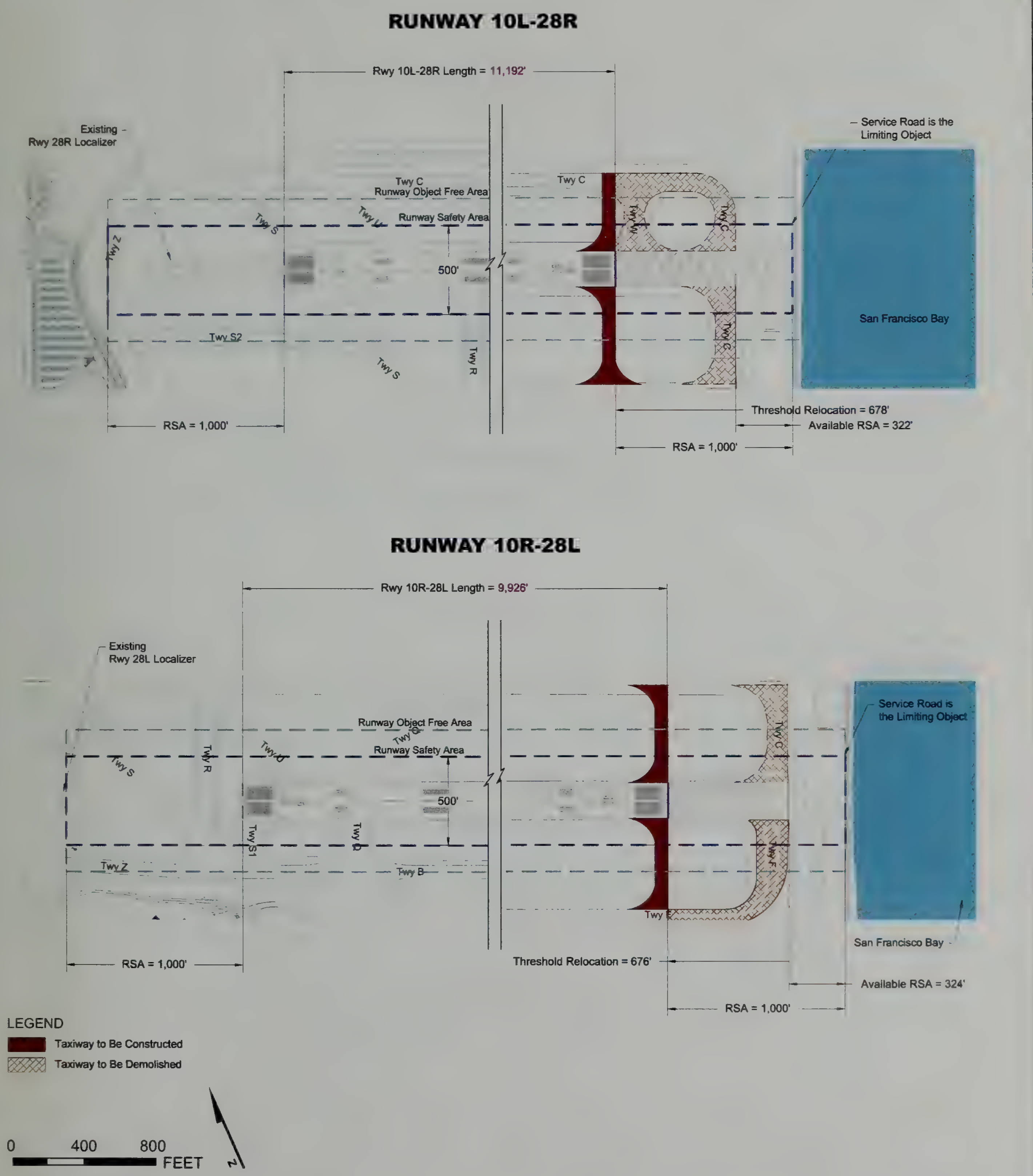
- Runway 10L TORA/TODA[2]: 11,870 feet
- Runway 10L ASDA/LDA[2]: 11,192 feet (reduced from 11,870 feet)
- Runway 28R TORA/TODA/ASDA: 11,870 feet
- Runway 28R LDA: 11,592 feet (reduced from 11,870 feet)

No taxiway or service road realignment is anticipated with the implementation of declared distances for Runway 10L-28R. FAA navigational aids for Runway 28R, however, would require relocation. Displacing the Runway 28R landing threshold would require relocating the two Runway 28R glide slope antennae (one for the Runway 28R ILS and one for the Runway 28R Simultaneous Offset Instrument Approach). Additionally, the exit taxiway layout may need to be modified to maintain runway occupancy times.

Figure 2-5 also depicts the Implement Declared Distances concept for Runway 10R-28L. The Runway 10R threshold would remain unchanged, because there already is a 1,000-foot RSA at that end. However, through the application of declared distances to provide a 1,000-foot safety distance to the service road, the Runway 10R ASDA and LDA would be less than the length of the runway. The Runway 10R TORA and TODA, however, would extend to the end of the runway. The Runway 28L threshold would be shifted 276 feet west of its existing location to provide 600 feet prior to the landing threshold. Runway 28L departures would begin takeoff roll at the runway end (existing threshold). As a result, the following declared distances would apply for Runway 10R-28L under the original concept for this alternative:

- Runway 10R TORA/TODA: 10,602 feet
- Runway 10R ASDA/LDA: 9,926 feet (reduced from 10,602 feet)
- Runway 28L TORA/TODA/ASDA: 10,602 feet
- Runway 28L LDA: 10,326 feet (reduced from 10,602 feet)

[2] TORA – Takeoff Run Available; TODA – Takeoff Distance Available; ASDA – Accelerate-Stop Distance Available; LDA – Landing Distance Available.



Notes:
1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.
2. Text shown in red font is a reduction in length of an existing condition.

Source:
R&A (2010a), Exhibits 4-2 and 4-7 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

RSA	Runway Safety Area
Twy	Taxiway

RUNWAYS 10L-28R AND 10R-28L REDUCE RUNWAY LENGTHS ALTERNATIVE

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San Francisco, California

FIGURE 2-4

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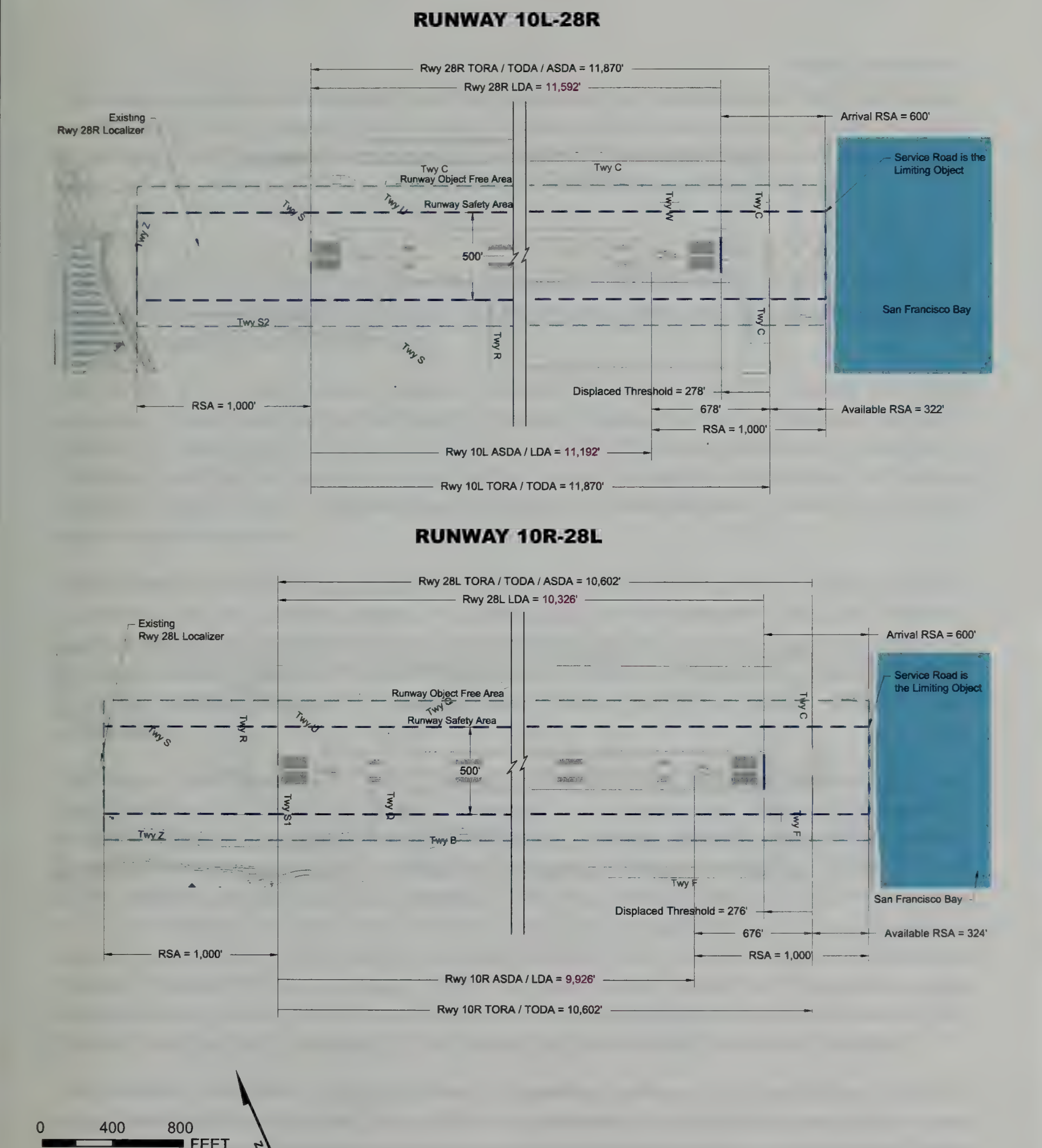

Notes:

1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.
2. Text shown in red font is a reduction in length of an existing condition.

Source:
R&A (2010a), Exhibits 4-3 and 4-8 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 10L-28R AND 10R-28L IMPLEMENT DECLARED DISTANCES ALTERNATIVE

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San Francisco, California

FIGURE 2-5

No taxiway or service road realignment would be required with the implementation of declared distances on Runway 10R-28L; however, the Runway 28L glide slope antennae would require relocation. Additionally, the exit taxiway layout may need to be modified to ensure the integrity of runway occupancy times.

Evaluation

This alternative met the Step 1 criterion and the purpose of and need for the Proposed Action. Because no significant construction would be required for this alternative, it also met the Step 2 criteria regarding practicability and implementation schedule.

With regard to the Step 3 criteria regarding impacts on the use of navigable airspace and airport operations, it was determined that the Implement Declared Distances concept by itself would reduce the Runway 10L ASDA from 11,870 feet to 11,192 feet, and the Runway 10R ASDA from 10,602 feet to 9,926 feet, which has the potential to reduce maximum aircraft payload and aircraft range, and limit the markets for certain aircraft. The airlines noted that ASDA is the critical calculation used when determining aircraft takeoff performance.

Airline representatives indicated that although a 678-foot reduction in the Runway 10L ASDA may reduce an aircraft's maximum takeoff capability, it probably would not be significant. They also noted that because Runway 10L departures are over water, obstruction issues would be minimal and mitigate the impacts to payload. However, the operational impact of reducing the Runway 10R ASDA to 9,926 feet could be significant, especially in situations when Runway 10L-28R is closed, such as during maintenance.

FAA Airport Traffic Control Tower (ATCT) personnel at the SFO ATCT noted that significant arrival and departure delays occur when the Airport is operating in an easterly flow, where aircraft depart on Runways 10R and 10L and land on Runways 19R and 19L. Currently, parallel Runways 10L and 10R are separated by 750 feet from the runway centerlines, with a threshold stagger greater than 499 feet. To avoid unsafe conditions associated with wake turbulence (vortex winds created at aircraft wingtips when airborne), ATCT must separate any aircraft taking off from parallel runways separated by less than 2,500 feet by ensuring that the trailing aircraft does not start takeoff roll until at least 3 minutes after a heavy aircraft has taken off. Section 9 of FAA Joint Order 7110.65T, *Air Traffic Control*, indicates that if the parallel runways are separated by less than 2,500 feet and have runway thresholds staggered by less than 500 feet, the time between departures can be decreased to 2 minutes after the heavier aircraft has begun its takeoff roll.

Poor weather conditions are typically the reason for operating the Airport in an easterly flow, cutting the Airport operational capacity in half. One aircraft arrival alternates with one aircraft departure, as opposed to operations in a westerly flow when two aircraft can depart alternating with two aircraft arriving. Due to the existing Runway 10R and 10L thresholds being staggered by more than 500 feet, ATCT must allow 3 minutes for wake turbulence departure separation, which increases departure delays during inclement weather conditions. ATCT staff requested that the Airport modify the Implement Declared Distances basic concept to include a relocation of the Runway 10R threshold to the west, and provide for threshold separation of 499 feet or less, which will minimize wake turbulence and reduce wait time between departures, thus reducing delays.

Refining the Airport's preferred alternative ultimately centered on examining a relocation of the Runway 10R threshold to preserve Runway 10R departure length, and enhance departure operations on both Runways 10L and 10R. As a result, the Runway 10R approach (western) end is proposed to be relocated 781 feet west, reducing the Runway 10L and 10R threshold stagger to less than 500 feet. This refinement preserves existing Runway 10R takeoff capability while reducing departure delays in easterly flow operations caused by the need to wait for wake turbulence to dissipate.

Figure 2-6 shows the refinements to the preferred alternative, which combines aspects of the Implement Declared Distances and Shift Runway basic concepts for Runways 10L-28R and 10R-28L. This preferred alternative incorporates the features necessary to achieve an equivalent RSA for each runway, minimizes operational impacts (i.e., not reduce the ASDA), and enhances operational capability. Due to obstructions to the Runway 28L Terminal Instrument Procedures departure surface, the TORA and TODA for Runway 28L are reduced to less than the total runway length. At the eastern end, the Runway 28L and 28R landing threshold displacements were improved from the minimum 276 feet and 278 feet, respectively, required to provide 600 feet prior to the landing threshold, to 300 feet, which mitigates the need to relocate the approach light structures in the SF Bay.

Because the refined version of this alternative would meet all criteria of the 3-step evaluation process, it has been carried forward for evaluation in this EA.

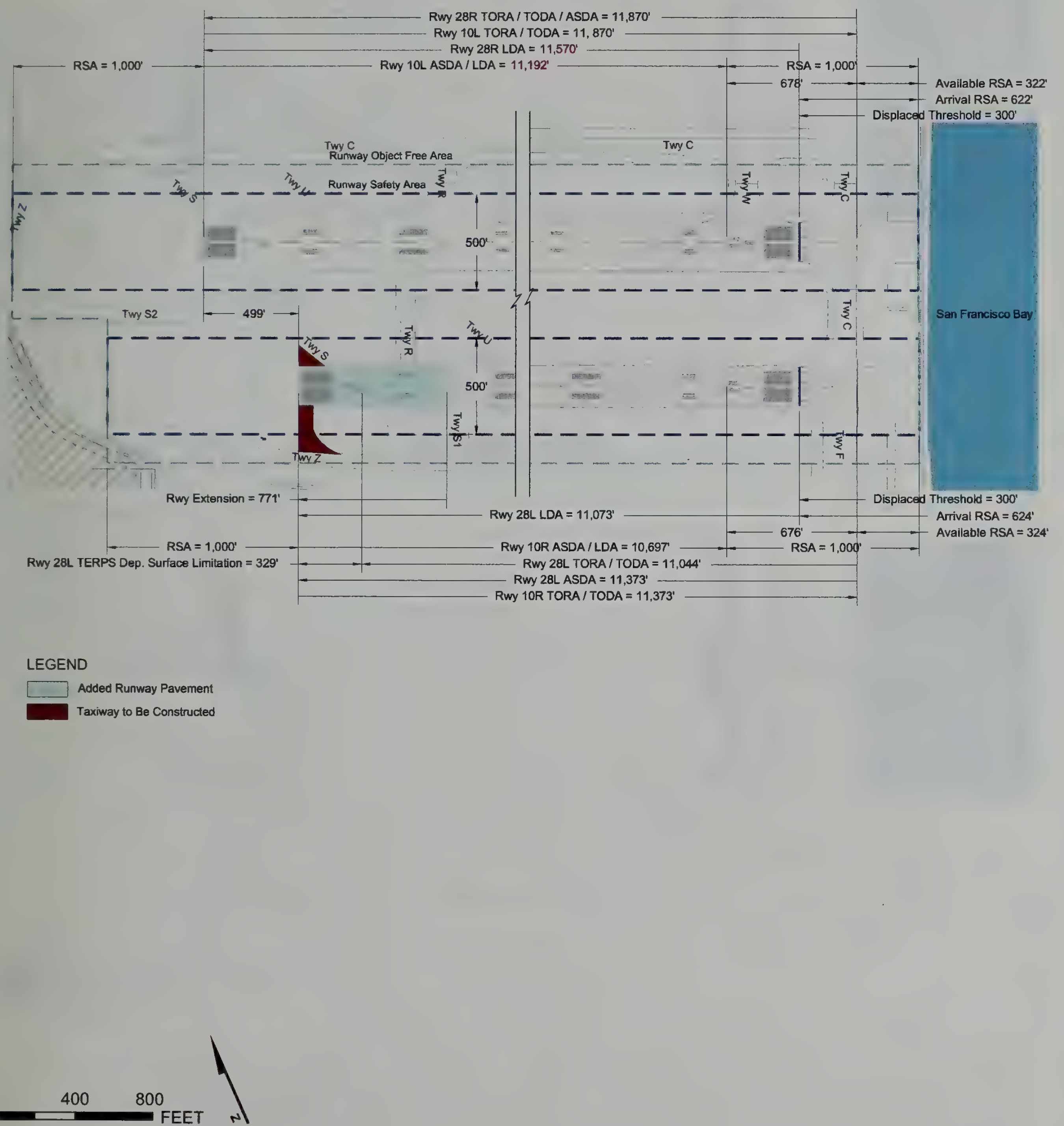
2.5.1.5 Install Standard Engineered Materials Arresting Systems

Standard EMAS installations on both ends of Runways 10L-28R and 10R-28L would provide an equivalent level of safety as a standard RSA for aircraft entering the EMAS at 70 knots while maintaining the existing runway lengths. **Figure 2-7** shows that a 300-foot shift of Runway 10L-28R and a 296-foot shift of Runway 10R-28L to the west would be required to accommodate standard EMAS beds. Standard EMAS installations at the Runway 10L and 10R ends would require realigning Taxiways S, C, F, and W. The realignment of Taxiways Z and S2 may be needed for aircraft to remain clear of the proposed RSA, and provide unrestricted movement of aircraft on these taxiways. FAA navigational aids (e.g., glide slope antennae and localizers) would also require relocation. Additionally, the exit taxiway layouts may need to be modified to ensure the integrity of runway occupancy times.

Evaluation

The Install Standard EMAS alternative would meet the purpose and need criterion of Step 1. Although new taxiways and other modifications would be required as described above, there would be no significant impediments to the construction of this alternative. The RSA Study Working Group determined that although this alternative met the Step 2 criteria regarding implementation schedule, because the Install Standard EMAS and Implement Declared Distances concepts both meet FAA RSA design standards, the significantly higher cost to install and continue maintaining EMAS would not be practical to implement. Thus, this alternative did not fully meet the Step 2 criteria. In addition, airline representatives indicated that if either runway were shifted west, departure performance could be reduced because the runway(s) would be moved closer to Sweeney Ridge, with a summit of 1,200 feet, and San Bruno Mountain. As a result, this alternative was not carried forward for evaluation in this EA.

RUNWAYS 10L-28R AND 10R-28L



Notes:

1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.
2. Text shown in red font is a reduction in length of an existing condition.

Source:
R&A (2010a), Exhibit ES-1 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 10L-28R AND 10R-28L IMPLEMENT DECLARED DISTANCES AND SHIFT RUNWAY ALTERNATIVE

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San Francisco, California

FIGURE 2-6

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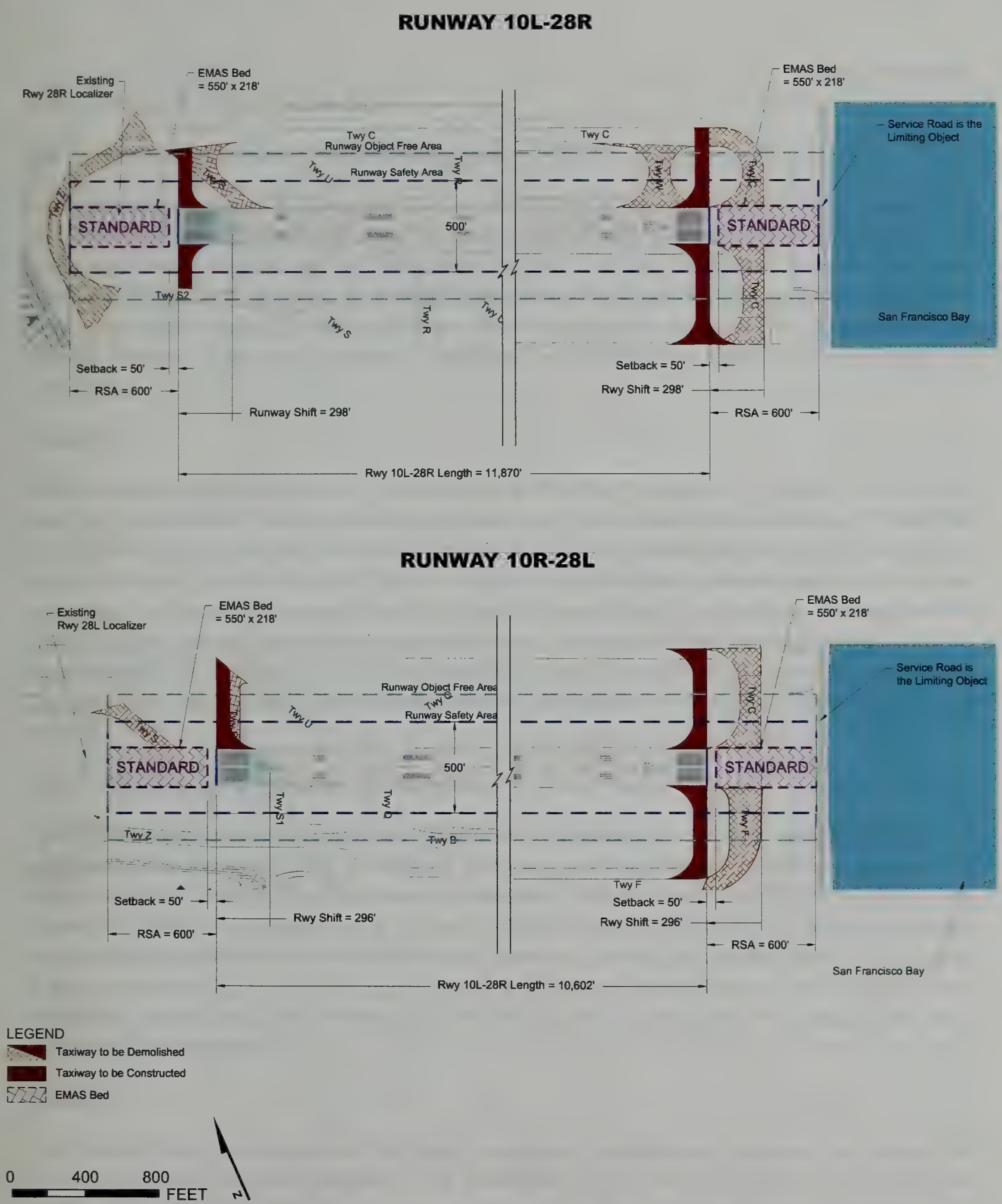

Acronyms and Abbreviations:
- EMAS Engineered Materials Arresting System
- RSA Runway Safety Area
- Twy Taxiway

Source:
R&A (2010a), Exhibits 4-4 and 4-9 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

RUNWAYS 10L-28R AND 10R-28L INSTALL STANDARD ENGINEERED MATERIALS ARRESTING SYSTEMS ALTERNATIVE

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-7

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2.5.2 RUNWAYS 1L-19R AND 1R-19L

2.5.2.1 Construct Standard Runway Safety Areas

As illustrated on **Figure 2-8**, development of standard RSAs at the northern ends of Runways 1L-19R and 1R-19L would require two fill pads, or construction of two platforms 770 feet wide each, and extending approximately 800 and 900 feet into the SF Bay. The total area of fill or platform construction would be approximately 30 acres. In addition, development of standard RSAs at the southern end of this runway pair would require relocation of the sea wall and the approach lighting system, realignment of the Millbrae Highline Canal, and relocation underground or realignment of South McDonnell Road and U.S. 101.

Evaluation

This alternative met the purpose and need criterion of the Step 1 evaluation. However, this alternative does not meet the Step 2 criteria regarding both practicability and implementation schedule. The SF Bay fill or platform concept and the required realignment of South McDonnell Road and U.S. 101 would have a very high cost. In addition, the SF Bay fill or platform would require extensive environmental review, permitting, and approval processes prior to the start of construction. The relocation or realignment of U.S. 101 would require substantial design effort in order to maintain traffic flows during construction. For these reasons, this alternative did not meet the Step 2 criteria of project completion by the end of 2015. This alternative was, therefore, eliminated from further consideration for Runways 1L-19R and 1R-19L in this EA.

2.5.2.2 Relocate, Shift, or Realign the Runways

The Shift Runway concept is shown on **Figure 2-9**. To provide a 1,000-foot standard RSA on the southern end of Runway 1L-19R, covering or relocating the South Detention Pond and relocating the Airport operations area (AOA) fence would be required. This would allow for a 215-foot shift of the Runway 1L approach (southern) end to the south. These improvements would not provide a standard 1,000-foot RSA on the northern end of the runway, where only 392 feet are available for a RSA. Although it may be possible to shift the Runway 1R-19L north to achieve standard RSAs, this concept was not considered by itself due to the extensive fill of the SF Bay that would be required, similar to the Install Standard RSAs alternative.

Evaluation

Due to the physical site constraints of the Airport, relocating or realigning the runways is not feasible. As a result, compliance with RSA standards is not achievable with this basic concept, and it does not meet the Step 1 criterion regarding the purpose of and need for the Proposed Action. Therefore, this alternative was not **individually** carried forward for evaluation in this EA. However, the Shift Runway concept was incorporated into the Refined Alternatives along with the Install Standard EMAS concept, as discussed in **Section 2.6**.

2.5.2.3 Reduce Runway Lengths

The Reduce Runway Lengths alternative is illustrated on **Figure 2-10**. As shown, in order to provided standard RSAs at each end of both runways, under this alternative Runway 1L-19R would be reduced in length from 7,500 feet to 6,286 feet and Runway 1R-19L would be reduced in length from 8,648 feet to 7,671 feet. This alternative would require the demolition or abandonment of Taxiways E and L.

The B757-200 (the design aircraft for Runway 1L-19R) may not be operationally capable of departing Runway 1L-19R at MGTOW under the Reduce Runway Length concept. Similarly, the B747-400 (the design aircraft for Runway 1R-19L) may not be operationally capable of departing Runway 1R-19L at MGTOW under this alternative. Based on airplane manufacturer's data, the Reduce Runway Length concept would result in a reduction in payload in certain markets depending on aircraft and runway used.

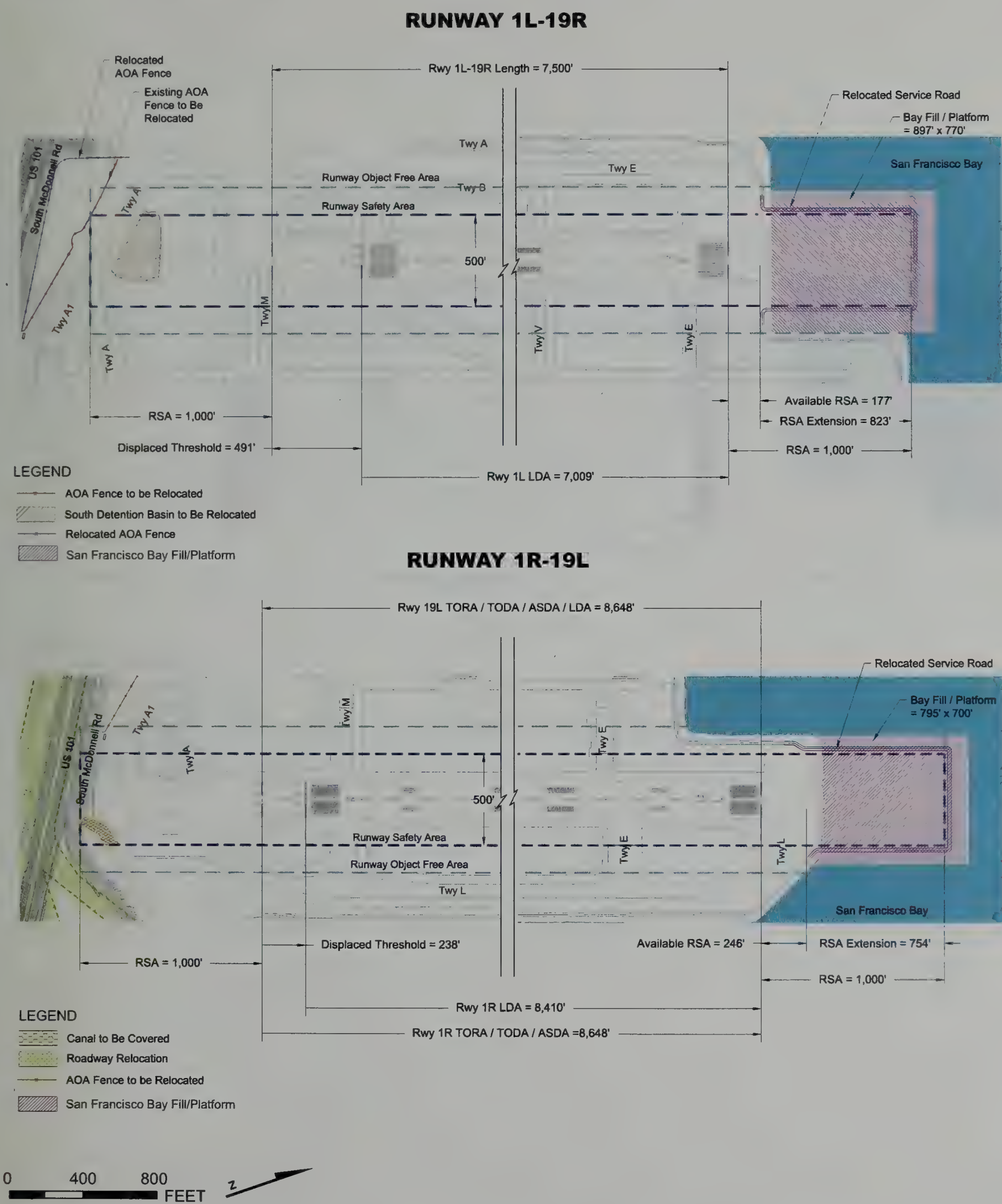
Evaluation

This alternative met the purpose and need criterion of the Step 1 evaluation, as well as the Step 2 criteria regarding practicality of development and implementation schedule. However, this alternative did not meet the Step 3 criteria regarding the safe and efficient use of airspace and the minimization of impacts on airfield operations. The RSA Study Working Group concluded that the Reduce Runway Length concept would result in adverse operational impacts because of the reduced payload/range capabilities for these runways; or because the requirement for additional aircraft to depart from the longer primary arrival Runways 10L-28R and 10R-28L would adversely affect the airport's ability to accommodate existing users. For these reasons, this alternative was not carried forward to evaluation in this EA.

2.5.2.4 Implement Declared Distances

The Implement Declared Distances alternative is illustrated on **Figure 2-11**. Under this alternative, the Runway 1L departure point and displaced threshold would remain unchanged. The RSA at the Runway 1L approach (southern) end would start at the South Detention Pond located south of the runway end, and extend 1,000 feet north, 391 feet onto the runway. This would result in a shortened ASDA and LDA on Runway 19R. The Runway 19R arrival RSA would start at the service road and extend 600 feet south, 423 feet onto the runway. The Runway 19R threshold would be displaced by 423 feet as a result, reducing the Runway 19R LDA. The Runway 1L ASDA and LDA would extend to a distance 1,000 feet from the service road located north of Runway 19R. The Runways 1L and 19R TORA and TODA would extend the full length of the runway, regardless of the displaced thresholds. As a result, the following declared distances would apply under the original concept for this alternative:

- Runway 1L ASDA = 6,677 feet (reduced from 7,500 feet)
- Runway 1L TORA/TODA = 7,500 feet
- Runway 1L LDA = 6,186 feet (reduced from 7,500 feet)
- Runway 19R ASDA = 7,109 feet (reduced from 7,500 feet)
- Runway 19R TORA/TODA = 7,500 feet
- Runway 19R LDA = 6,686 feet (reduced from 7,500 feet)



Notes:

1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.

Source:
R&A (2010b), Exhibits 4-1 and 4-5 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

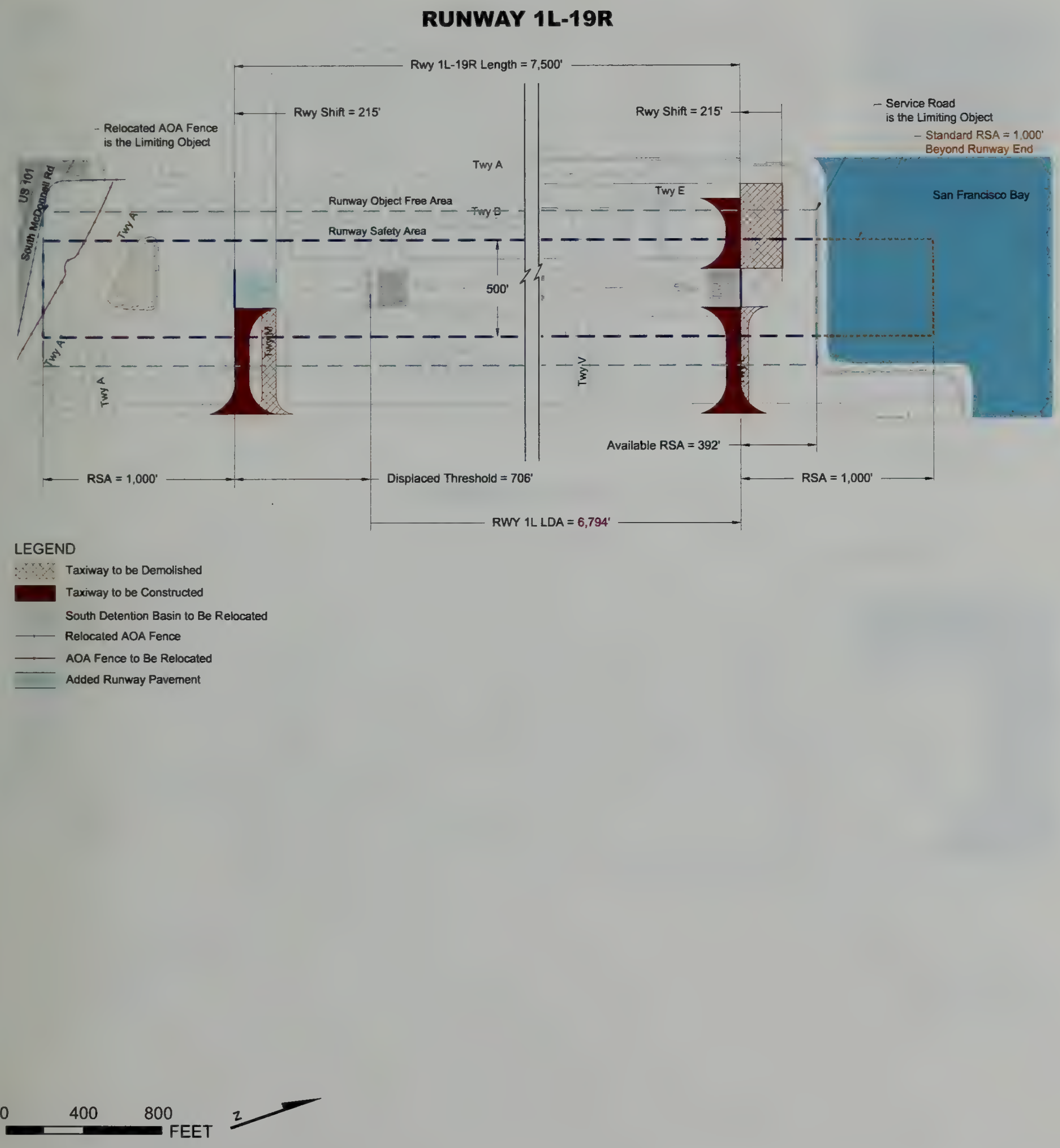
ASDA	Accelerate-Stop Distance Available
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 1L-19R AND 1R-19L CONSTRUCT STANDARD RUNWAY SAFETY AREAS ALTERNATIVE

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-8

11/28/11 vsa/hk ...T:\SFO RSA\EA Jun11\Fig2-8_1-19 construct.ai



Notes:

1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.
2. Text shown in red font is a reduction in length of an existing condition.

Source:
R&A (2010b), Exhibit 4-6 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

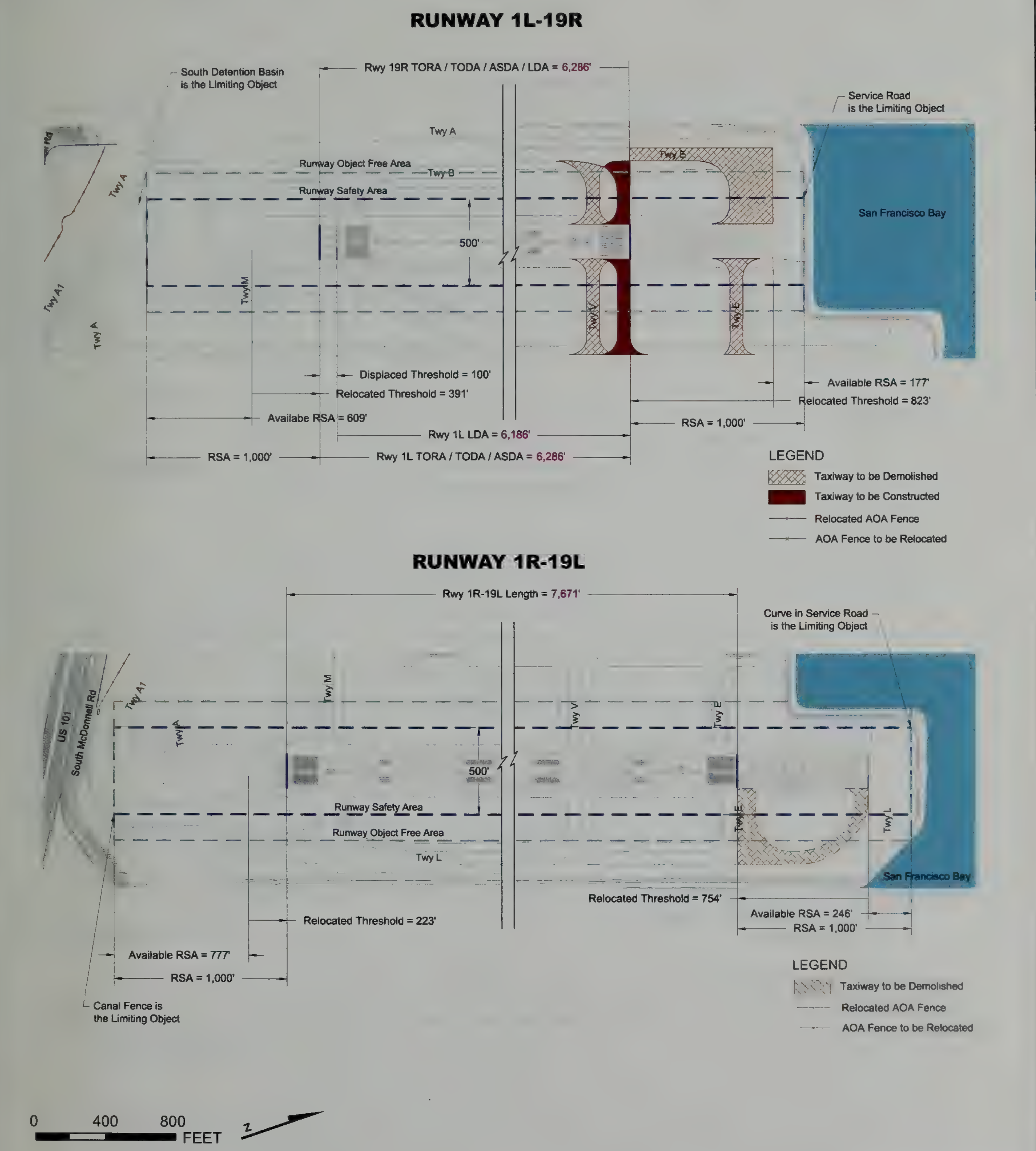
Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
EMAS	Engineered Materials Arresting System
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAY 1L-19R
RELOCATE, SHIFT, OR REALIGN THE RUNWAYS ALTERNATIVE

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-9



Notes:
1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.
2. Text shown in red font is a reduction in length of an existing condition.

Source:
R&A (2010b), Exhibits 4-2 and 4-7 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

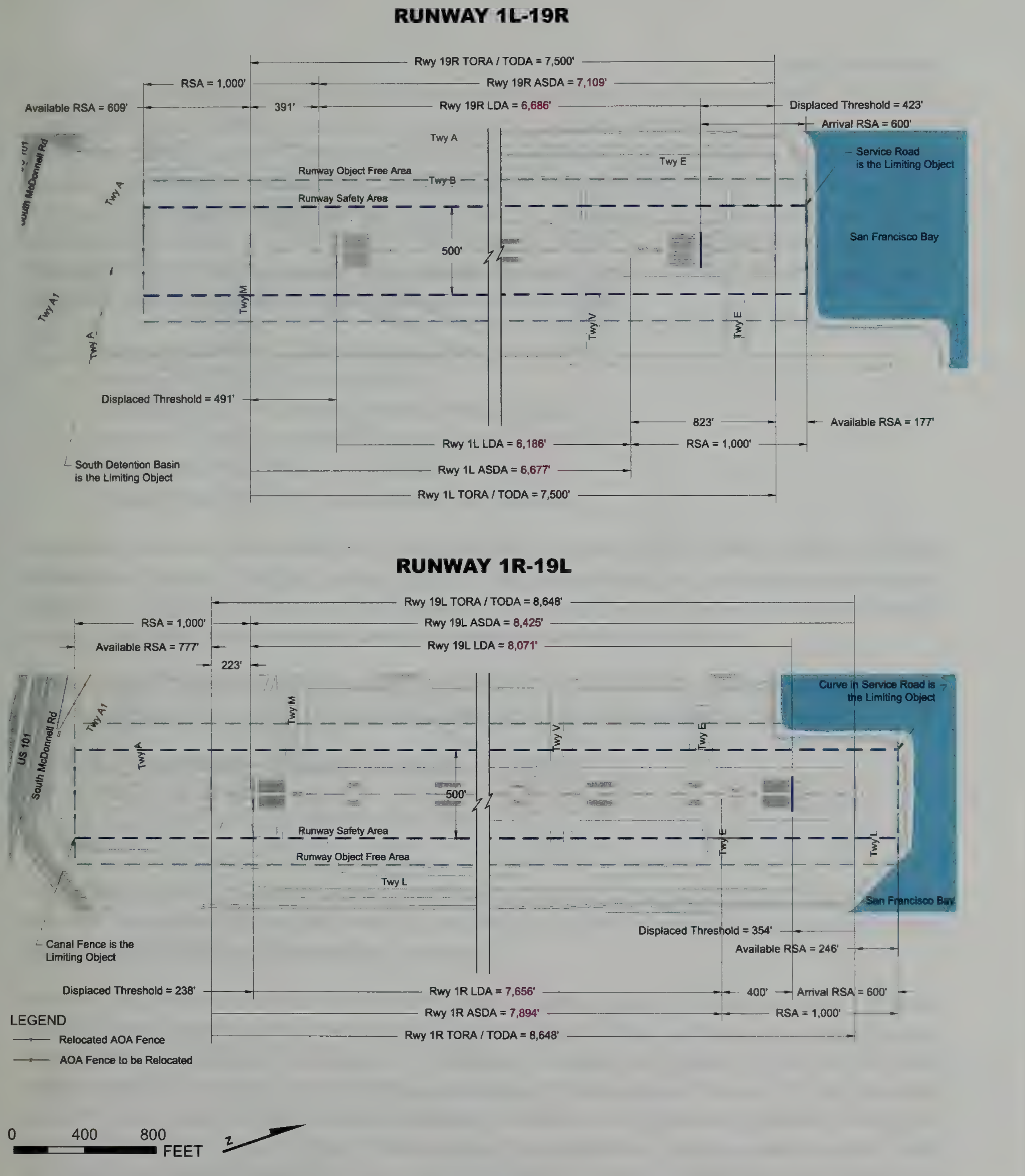
ASDA	Accelerate-Stop Distance Available
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 1L-19R AND 1R-19L
REDUCE RUNWAY LENGTHS ALTERNATIVE

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-10

11/28/11 vsa/hk ...T:\SFO RSA\EA Jun11\Fig2-10_1-19 reduce.ai



Notes:

1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.
2. Text shown in red font is a reduction in length of an existing condition.

Source:
R&A (2010b), Exhibits 4-3 and 4-8 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 1L-19R AND 1R-19L IMPLEMENT DECLARED DISTANCES ALTERNATIVE

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-11

11/28/11 vsa/hk ...T:\SFO RSA\EA Jun11\Fig2-11_1-19 implement.ai

The Runway 1R threshold would be co-located with the existing "power-up" point, and the Runway 1R displaced landing threshold would remain unchanged. To provide a 600-foot RSA prior to the landing threshold, the Runway 19L landing threshold would be displaced 354 feet from the existing threshold location. To provide a 1,000-foot RSA at either end of the runway to protect for overruns, the Runway 1R ASDA would be reduced from 8,648 feet to 7,894 feet, and the Runway 1R LDA would be reduced from 8,410 feet to 7,656 feet. The Runway 19L ASDA would be reduced from 8,648 feet to 8,425 feet, and the Runway 19L LDA would be reduced from 8,648 feet to 8,071 feet. As a result, the following declared distances would apply under the original concept for this alternative:

- Runway 1R ASDA = 7,894 feet (reduced from 8,648 feet)
- Runway 1R TORA/TODA = 8,648 feet
- Runway 1R LDA = 7,656 feet (reduced from 8,410 feet)
- Runway 19L ASDA = 8,425 feet (reduced from 8,648 feet)
- Runway 19L TORA/TODA = 8,648 feet
- Runway 19L LDA = 8,071 feet (reduced from 8,648 feet)

No taxiway or service road realignment is anticipated to be required with the implementation of declared distances on Runway 1L-19R or Runway 1R-19L. FAA navigational aids for both runways would require relocation. Displacing or relocating the Runway 19R threshold would change the distance from the runway threshold to the exit taxiways, which could affect runway occupancy times.

The Implement Declared Distances concept results in the reduction of the effective runway lengths for Runways 1R-19L and 1L-19R. The effective runway departure lengths are reduced as follows:

- Runway 1R ASDA reduced from 8,648 feet to 7,894 feet
- Runway 1L ASDA reduced from 7,500 feet to 6,677 feet

Evaluation

This alternative met the Step 1 criterion regarding the purpose of and need for the Proposed Action. Because no significant construction would be required for this alternative, it also met the Step 2 criteria regarding practicability and implementation schedule.

However, this alternative did not meet the Step 3 criteria regarding impacts to airfield operations. The RSA Study Working Group concluded that the B757-200 (the design aircraft for Runway 1L-19R) is currently weight-limited for departures on Runway 1L. Additionally, available data suggest that the B747-400 (the design aircraft for Runway 1R-19L) is currently weight-limited for departures on Runway 1R. This alternative, by itself, would result in a further reduction in payload in certain markets depending on aircraft, runway use, and airfield conditions. The RSA Study Working Group concluded that this alternative was not viable due to the operational impacts resulting from the reduced payload or range capabilities for these runways; or alternatively, the requirement for additional aircraft to depart from the longer primary arrival Runways 10L-28R and 10R-28L. For these reasons, this alternative was not **individually** carried forward for evaluation in this EA.

2.5.2.5 Install Standard Engineered Materials Arresting Systems

This alternative is illustrated on **Figure 2-12**. Standard EMAS installations on both ends of Runway 1L-19R would provide RSA compliance while maintaining the existing runway length of 7,500 feet, but would require a 443-foot runway shift to the south to accommodate a standard 600-foot-long EMAS bed located at the Runway 19R approach (northern) end. An EMAS installation at the Runway 1L approach (southern) end would require the closure of portions of Taxiways A and A1. Standard EMAS installation at the Runway 19R approach (northern) end would require the realignment of Taxiway E, both east and west of the runway, as well as relocation of the Runway 19R run-up pad. For both runway ends, FAA navigational aids such as glide slope antennas, approach lights, and runway lighting would also require relocation.

The declared distances associated with this EMAS concept are as follows:

- Runway 1L TORA/TODA/ASDA[3] = 7,500 feet
- Runway 1L LDA[4] = 6,566 feet (reduced from 7,500 feet)
- Runway 19R = 7,500 feet

Figure 2-12 also illustrates the installation of standard EMAS beds on both ends of Runway 1R-19L. To avoid SF Bay fill under this alternative, the northern end of Runway 1R-19L would be shifted 354 feet south. Realignment of Taxiway L at the Runway 19L approach (northern) end would be required to permit an EMAS installation. The southern end of Runway 1R-19L would be shifted 258 feet south to maximize available runway lengths, resulting in a 496-foot displaced threshold. An EMAS installation at the Runway 1R approach (southern) end would require the closure of Taxiways A and A1. FAA navigational aids for both runway ends would also require relocation. Shifting the runway would change the distance from the runway thresholds to the exit taxiways, and may affect runway occupancy times.

The declared distances associated with this EMAS concept are as follows:

- Runway 1R TORA/TODA/ASDA[3] = 8,552 feet (reduced from 8,648 feet)
- Runway 1R LDA[4] = 8,056 feet (reduced from 8,648 feet)
- Runway 19L = 8,552 feet (reduced from 8,648 feet)

Evaluation

This alternative met the purpose and need criterion of the Step 1 evaluation. The RSA Study Working Group concluded that the Install Standard EMAS concept by itself appeared to have the least amount of impact from a cost and environmental standpoint, and could be implemented by December 31, 2015, and thereby met the Step 2 evaluation criteria. However, the reduction in effective departure length would negatively impact operational capabilities. Therefore, this alternative individually did not meet the Step 3 evaluation criterion regarding impacts on airfield operations, and was not **individually** carried forward for evaluation in this EA. However, the Install Standard EMAS concept was incorporated into the Refined Alternatives, along with the Shift Runway concept, as discussed in **Section 2.6**.

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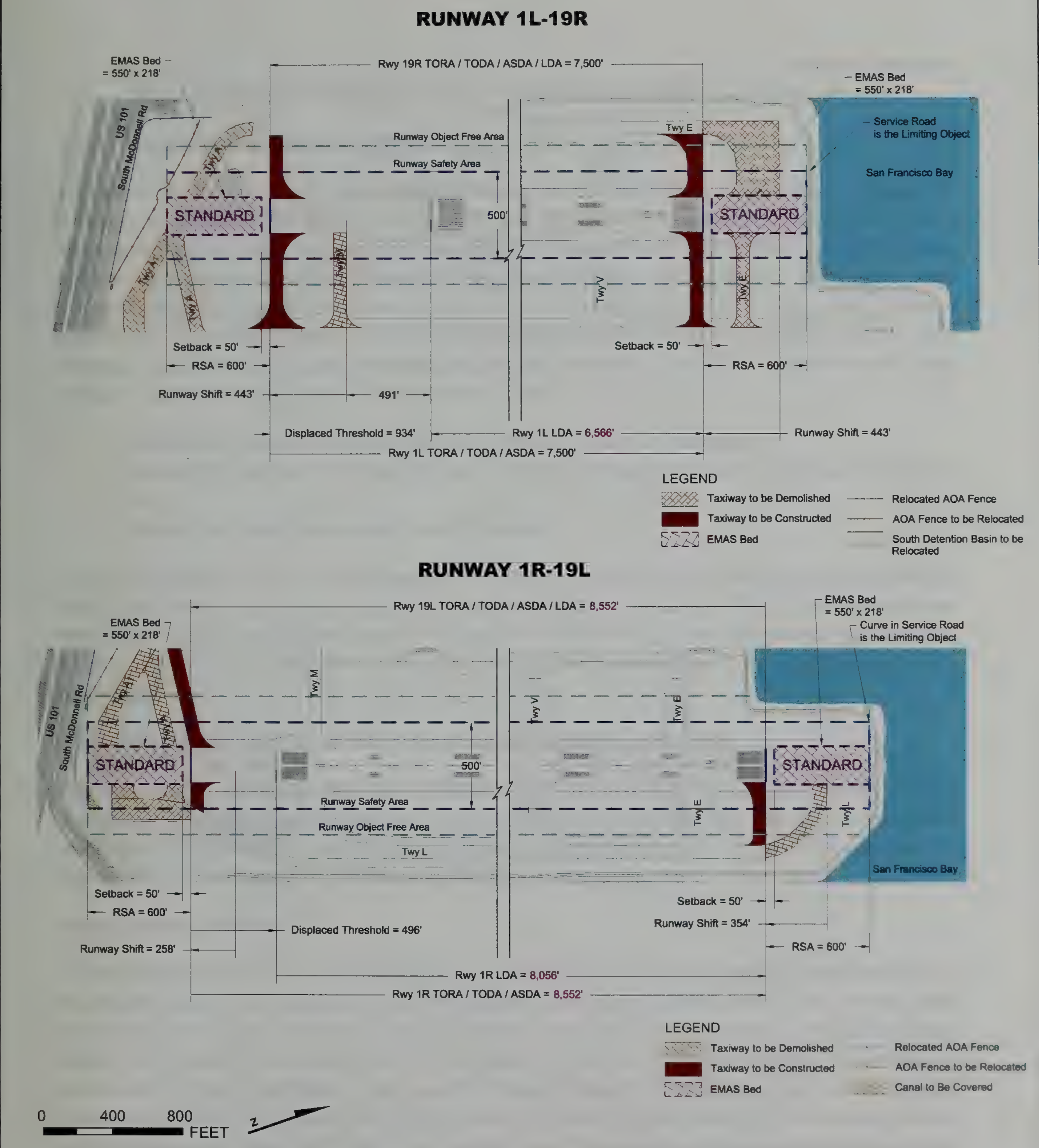
3 TORA – Takeoff Run Available; TODA – Takeoff Distance Available; ASDA – Accelerate-Stop Distance Available.
4 LDA – Landing Distance Available.



Notes:

1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.
2. Text shown in red font is a reduction in length of an existing condition.

Source:
R&A (2010b), Exhibits 4-4 and 4-9 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
EMAS	Engineered Materials Arresting System
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 1L-19R AND 1R-19L INSTALL STANDARD ENGINEERED MATERIALS ARRESTING SYSTEMS ALTERNATIVE

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-12

2.6 DEVELOPMENT OF REFINED ALTERNATIVES FOR RUNWAYS 1L-19R AND 1R-19L

2.6.1 DEVELOPMENT OF REFINED ALTERNATIVES

As outlined in **Section 2.5.2**, implementation of any of the four individual basic RSA concepts for Runways 1R-19L or 1L-19R did not meet the three-step alternatives evaluation process. The RSA Study Working Group concluded that concepts combining the Install Standard EMAS and the Shift Runway concepts appeared promising and should be developed for further consideration. Thirty-seven initial possible alternatives were developed by combining RSA basic concepts. These were mostly a combination of specific elements from the Install Standard EMAS concept, and aspects of the other concepts necessary to mitigate operational impacts and achieve a viable RSA improvement for each runway. These alternatives were classified in three groups:

- Alternatives maintaining the existing thresholds and displaced thresholds;
- Alternatives maintaining the existing thresholds but eliminating the existing displaced thresholds; and
- Alternatives shifting the existing runway thresholds.

The 37 alternatives were also consolidated into 15 distinct alternatives for evaluation purposes because many of the alternatives represented minor variations of other alternatives. The 15 remaining refined alternatives that were qualitatively reviewed by the RSA Study Working Group are described in **Table 2-1**. **Table 2-2** summarizes each of the 15 refined alternatives and describes the RSA Study Working Group's screening results.

2.6.2 DESCRIPTION AND EVALUATION OF SHORT-LISTED REFINED ALTERNATIVES

Five of the refined alternatives described in **Tables 2-1** and **2-2** were subsequently shortlisted by the RSA Study Working Group for further analysis. These alternatives are described and evaluated in more detail below, using the three-step process. Also included is a variation of one of the short-listed alternatives (Alternative 6A) that was developed during the RSA study process.

2.6.2.1 Refined Alternative 1

This alternative, which is illustrated on **Figure 2-13**, attempts to maximize the available standard RSAs on the southern ends of Runways 1L-19R and 1R-19L and install minimal EMAS areas on the northern ends of the runways to avoid placement of fill or platforms in the bay. The Taxiway A and A1 alignments around the southern ends would remain unchanged to maintain current operational capabilities of independent runway operation. The existing runway stagger of 498 feet would be maintained. Taxiway M would be demolished, and a replacement crossover taxiway would be constructed to allow aircraft landing on Runway 19L to taxi to the terminal area. The South Detention Basin would be filled to meet standard RSA grading requirements. A box culvert would be constructed over the Millbrae Highline Canal to establish a standard RSA on the southern end of Runway 1R-19L. The AOA fence located south of Runway 1L would be realigned further south to remain clear of the runway object-free area.

Table 2-1
Descriptions of Runways 1L-19R and 1R-19L Refined Alternatives
San Francisco International Airport

Alternative	Description
R1	This alternative would provide standard RSAs on the southern ends of Runways 1L-19R and 1R-19L using declared distances, and would provide nonstandard EMAS beds on the northern ends of the runways. The nonstandard EMAS beds would be installed between the existing runway ends and the service roads, about 122 feet long by 218 feet wide at the Runway 19R end, and 211 feet long by 218 feet wide at the Runway 19L end. No fill into SF Bay would be required. Existing runway ends and 498-foot stagger would be maintained while eliminating displaced thresholds. Declared distances would result in the Runway 19L Accelerate-Stop Distance Available (ASDA) and LDA being reduced from 8,648 feet to 8,507 feet.
R2	This alternative would provide a standard RSA at the southern end of Runway 1R-19L, and a standard EMAS bed at the southern end of Runway 1L-19R. This alternative would provide nonstandard EMAS beds on the northern ends of the runways similar to those described for Refined Alternative R1. This alternative would not require relocating any of the four runway ends on Runways 1L-19R and 1R-19L. This alternative would maintain the existing threshold stagger of 498 feet between Runways 1R and 1L. No fill in SF Bay would be required. Declared distances would be required on Runway 19L, resulting in the Runway 19L ASDA and LDA being reduced from 8,648 feet to 8,507 feet.
R3	This alternative would maintain the existing runway ends of Runways 1L-19R and 1R-19L, and would provide standard RSAs on the southern ends of the runways using declared distances. This alternative includes installation of standard EMAS at the northern ends of the runways, requiring SF Bay fill or the construction of two platforms in the bay waters, one extending 497 feet beyond the current shoreline and 770 feet in width, and the other extending 395 feet beyond the current shoreline, and 700 feet in width. Both EMAS beds would require approximately 15.13 acres of SF Bay fill or platform construction. This alternative would maintain the existing threshold stagger of 498 feet between Runways 1R and 1L. Declared distances would be required on Runway 19L, resulting in the Runway 19L ASDA and LDA being reduced from 8,648 feet to 8,507 feet.
R4	This alternative would provide standard RSAs on the southern ends of Runways 1L-19R and 1R-19L, and would provide standard EMAS installations on the northern end of each runway. To minimize the amount of SF Bay fill or platform area for the installation of the EMAS bed, Runway 1R-19L would be shifted 216 feet south, which would reduce the threshold stagger to 141 feet between Runways 1R and 1L. The fill or platforms would extend 281 feet and 536 feet beyond the current shoreline, measuring 700 and 770 feet for Runways 19R and 19L, respectively, and would total approximately 7.72 acres of SF Bay fill or platform area. Existing runway distances would not be reduced in this alternative.
R4B	This alternative is a variation of Refined Alternative R4. Standard EMAS beds would be installed at the northern ends of Runways 1L-19R and 1R-19L without any SF Bay fill. Standard RSAs would be installed at the southern ends of both runways. Runway 1L-19R would shift 443 feet south, and Runway 1R-19L would shift 354 feet south to accommodate the standard EMAS beds. Providing standard RSAs and runway object- free areas at the south runway ends would require the relocation of South McDonnell Road, U.S. 101, and the southern portion of the Airport's WOB area. The WOB property is located west of U.S. 101 and contains utilities and the BART alignment, as well as known threatened and endangered species. This alternative would provide a threshold stagger of 409 feet between Runways 1R and 1L. The proposed locations of the south runway ends would require the implementation of displaced thresholds. As a result, the Runway 1L LDA would be reduced from 7,500 feet to 7,445 feet, and the Runway 1R LDA from 8,648 feet to 8,158 feet.

Table 2-1
Descriptions of Runways 1L-19R and 1R-19L Refined Alternatives
San Francisco International Airport (Continued)

Alternative	Description
R5	This alternative would provide standard EMAS beds at the northern ends of Runways 1L-19R and 1R-19L. Runway 1L-19R would shift by 255 feet on the southern end and by 199 feet on the northern end to maintain the existing runway length. Standard RSAs would be provided at the southern ends of both runways, requiring the use of declared distances on Runway 19L, and resulting in the Runway 19L ASDA and LDA being reduced from 8,648 feet to 8,507 feet. This alternative would maintain the existing threshold stagger of 498 feet between Runways 1R and 1L. Installation of standard EMAS beds would require SF Bay fill that extend 298 feet from the existing shoreline and measure 770 feet in width. The SF Bay fill north of Runway 19L would extend 395 feet into SF Bay waters and measure 700 feet in width. A total of approximately 9.10 acres of fill would be constructed for installation of the EMAS beds.
R6	This alternative would install nonstandard EMAS beds behind all four runway ends. The lengths of the EMAS beds would be maximized by shifting the runway south as far as the proposed realignment of Taxiway A allows. Runway 1L-19R would shift south 374 feet, providing nonstandard EMAS beds approximately 495 feet long by 218 feet wide on either end. Likewise, Runway 1R-19L would shift south 156 feet, providing nonstandard 366-foot-long EMAS beds on either end. This alternative would provide a threshold stagger of 279 feet between Runways 1R and 1L. At the northern ends, nonstandard EMAS beds would be installed between the existing runway ends and the service roads. The limited amount of space available on the northern ends would only allow for nonstandard EMAS beds, about 495 feet long by 218 feet wide at the Runway 19R end and 366 feet long by 218 feet wide at the Runway 19L end. There would be no SF Bay fill and existing runway distances would be maintained.
R7	This alternative would install standard EMAS beds at the northern and southern ends of Runway 1L-19R, and nonstandard EMAS beds on the northern and southern ends of Runway 1R-19L; it would not require SF Bay fill. Runway pavement would be added to the southern end of each runway to accommodate a shift of 443 feet south on Runway 1L, and a shift of 307 feet south of Runway 1R. Independent function of Taxiways A and A1 would be lost. Existing runway distances would not be reduced in this alternative.
R8	This alternative would install standard EMAS beds at all four runway ends. To minimize the amount of SF Bay fill at the northern ends of the runways, the EMAS beds on the southern ends would be installed as far south as the proposed realignment of Taxiway A allows. Runway 1L-19R would be shifted south by 304 feet, and Runway 1R-19L would be shifted north by 43 feet. This alternative would provide a threshold stagger of 151 feet between Runways 1R and 1L. The EMAS beds installed at the northern ends of the runways would require 153 feet long by 770 feet wide of SF Bay fill and/or platform at the Runway 19R end and 438 feet long by 700 feet wide at the Runway 19L end. A total of approximately 9.74 acres of fill or platform would be constructed for installation of the EMAS beds. This alternative would provide a threshold stagger of 151 feet between Runways 1R and 1L. Existing runway distances would not be reduced in this alternative.
R8B	This alternative would install standard EMAS beds at all four runway ends without fill or platforms in SF Bay. Runway pavement would be added to the southern ends of both runways, shifting Runway 1L-19R south by 443 feet and Runway 1R-19L south by 354 feet. Installation of standard EMAS beds would require relocation of South McDonnell Road, U.S. 101, and the southern portion of the Airport's property on the west side of U.S. 101. Declared distances would be required, reducing the LDA to 7,445 feet on Runway 1L and 8,158 feet on Runway 1R.
R9	This alternative would install standard EMAS beds at all four runway ends, with a reduced bay fill or platform construction at the northern end of Runway 1R-19L. Approximately 2.18 acres of SF Bay fill would extend 136 feet from the existing shoreline and would be 700 feet in width. Runways 1L-19R and 1R-19L would shift south 443 and 259 feet to eliminate SF Bay fill north of Runway 19R, and minimize fill north of Runway 19L. Both runway shifts would require additional runway pavement south of the existing runway ends to accommodate the equivalent loss of runway pavement on the northern end. This alternative would provide a threshold stagger of 314 feet between Runways 1R and 1L. Declared distances would be required on Runway 1L, reducing the LDA to 7,445 feet Taxiways A and A1 would not function independently.

Table 2-1
Descriptions of Runways 1L-19R and 1R-19L Refined Alternatives
San Francisco International Airport (Continued)

Alternative	Description
R9B	This alternative would install standard EMAS beds at all four runway ends with no bay fill or platforms, while avoiding relocation of U.S. 101. Both runway pairs would be shifted south to accommodate installation of standard EMAS beds on the northern ends. Runway 1L on the approach (southern) end would be shifted by 443 feet; similarly, Runway 1R would be shifted by 354 feet to the south. Taxiways A and A1 would be demolished. Due to installation of the standard EMAS bed south of Runway 1R, South McDonnell Road would be depressed (e.g., underground). This alternative would provide a threshold stagger of 409 feet between Runways 1R and 1L, and a threshold stagger of 279 feet between Runways 1R and 1L. Declared distances would be required on Runway 1R, resulting in the LDA being reduced to 8,158 feet. Declared distances on Runway 1L would reduce the LDA from 7,500 feet to 7,445 feet. Taxiways A and A1 would not function independently.
R10	This alternative would provide full standard RSAs on all ends of Runways 1L-19R and 1R-19L without the use of EMAS. Runway 1L-19R would be shifted south by 216 feet to accommodate the loss of effective runway length on the northern end. Conversely, Runway 1R-19L would shift north by 141 feet to accommodate the standard RSA on the southern end. The equivalent amount of runway pavement would be added to the northern end. Bay fill or a platform area on the northern end of Runway 19R would extend 682 feet long and 770 feet wide. For Runway 19L, bay fill or the platform area would extend about 936 feet in length and 700 feet in width. A total of approximately 27 acres of bay fill or a platform would need to be constructed. This alternative would provide a threshold stagger of 141 feet between Runways 1R and 1L, and would maintain the existing effective runway lengths.
R11	This alternative would provide full standard RSAs on all ends of Runways 1L-19R and 1R-19L, without the use of EMAS installations. Runway 1L-19R would be shifted south by 255 feet on the Runway 1L approach (southern) end, and 199 feet south on the Runway 19R approach (northern) end. Runway 1R-19L would also shift south by 255 feet to accommodate a standard RSA on the southern end. This alternative would maintain the threshold stagger of 498 feet between Runways 1R and 1L. Bay fill or a platform area on the northern end of Runway 19R would extend 698 feet in length and 770 feet in width. For Runway 19L, bay fill or a platform area would extend about 795 feet in length and 700 feet in width. A total of approximately 25.11 acres of bay fill or a platform area would need to be constructed. Declared distances would be required on Runway 19L, reducing the Runway 19L ASDA and LDA from 8,648 feet to 8,507 feet.
R12	This alternative would provide full standard RSAs on all ends of Runways 1L-19R and 1R-19L without the use of EMAS beds, while maintaining the Runway 19L LDA. This alternative would maintain the existing threshold stagger of 498 feet between Runways 1R and 1L. SF Bay fill or a platform area on the northern end of Runway 19R would extend 897 feet in length and 770 feet in width. For Runway 19L, SF Bay fill or a platform area would extend about 936 feet in length and 700 feet in width. A total of approximately 30.98 acres of bay fill or a platform would need to be constructed. Declared distances would be required on Runway 19L; however, the existing runway distances would not be reduced in this alternative.

Source: R&A, 2010b
Notes:
ASDA = Accelerate-Stop Distance Available
EMAS = Engineered Materials Arresting System
LDA = Landing Distance Available
RSA = Runway Safety Area
U.S. 101 = U.S. Highway 101
WOB = West-of-Bayshore

Table 2-2
Runways 1L-19R and 1R-19L Refined Alternatives Comparative Matrix
San Francisco International Airport

Refined Alternative	Rwy End	Rwy Shift/ Relocation	Displaced Threshold	Declared Distances	Bay Fill	Standard RSA	EMAS Length[1]	Twy A/A1	Available Distances (feet)[2]				Impacts	Short-Listed
									TORA	TODA	ASDA	LDA		
R1	1L					X			7,500	7,500	7,500	7,009	• Operational (Minor) • Cost (Minor) • Environmental - Bay (Minor) • Environmental - Noise (Minor) • Overall RSA Improvement (Major)	Yes
	19R						122'		7,500	7,500	7,500	7,500		
	1R					X			8,648	8,648	8,648	8,648		
	19L			X			211'		8,648	8,648	(8,507)	(8,507)		
R2	1L						600'		7,500	7,500	7,500	7,009	• Operational (Minor) • Cost (Minor) • Environmental - Bay (Minor) • Environmental - Noise (Minor) • Overall RSA Improvement (Major)	No
	19R						122'		7,500	7,500	7,500	7,500		
	1R					X			8,648	8,648	8,648	8,648		
	19L			X			211'		8,648	8,648	(8,507)	(8,507)		
R3	1L					X			7,500	7,500	7,500	7,500	• Operational (Minor) • Cost (Major) • Environmental - Bay (Major) • Environmental - Noise (Minor) • Overall RSA Improvement (Minor)	No
	19R				497'		600'		7,500	7,500	7,500	7,500		
	1R					X			8,648	8,648	8,648	8,648		
	19L			X	395'		600'		8,648	8,648	(8,507)	(8,507)		
R4	1L	south 216'				X			7,500	7,500	7,500	7,500	• Operational (Minor) • Cost (Major) • Environmental - Bay (Major) • Environmental - Noise (Moderate) • Overall RSA Improvement (Minor)	Yes
	19R	south 216'			281'		600'		7,500	7,500	7,500	7,500		
	1R	north 141'				X			8,648	8,648	8,648	8,648		
	19L	north 141'			536'		600'		8,648	8,648	8,648	8,648		

Table 2-2
Runways 1L-19R and 1R-19L Refined Alternatives Comparative Matrix
San Francisco International Airport (Continued)

Refined Alternative	Rwy End	Rwy Shift/ Relocation	Displaced Threshold	Declared Distances	Bay Fill	Standard RSA	EMAS Length[1]	Twy A/A1	Available Distances (feet)[2]				Impacts	Short-Listed
									TORA	TODA	ASDA	LDA		
R4B	1L	south 443'	55'	X		X			7,500	7,500	7,500	(7,445)	• Operational (Minor) • Cost (Major) • Environmental - Bay (Minor) • Environmental - Noise (Moderate) • Overall RSA Improvement (Minor)	Yes
	19R	south 443'					600'		7,500	7,500	7,500	7,500		
	1R	south 354'	390'	X		X			8,648	8,648	8,648	(8,158)		
	19L	south 354'					600'		8,648	8,648	8,648	8,648		
R5	1L	south 255'				X			7,556	7,556	7,556	7,556	• Operational (Minor) • Cost (Major) • Environmental - Bay (Major) • Environmental - Noise (Moderate) • Overall RSA Improvement (Moderate)	No
	19R	south 199'		X	298'		600'		7,556	7,556	7,500	7,500		
	1R	south 255'	153'	X		X			8,903	8,903	8,903	8,750		
	19L	--		X	395'		600'		8,903	8,903	(8,507)	(8,507)		
R6	1L	south 374'						Realign	7,500	7,500	7,500	7,500	• Operational (Minor) • Cost (Moderate) • Environmental - Bay (Minor) • Environmental - Noise (Moderate) • Overall RSA Improvement (Moderate)	Yes
	19R	south 374'							7,500	7,500	7,500	7,500		
	1R	south 156'	54'	X				Realign	8,648	8,648	8,648	8,648		
	19L	south 156'							8,648	8,648	(8,507)	(8,507)		
R7	1L	south 443'	55'	X			600'	Remove	7,500	7,500	7,500	(7,445)	• Operational (Major) • Cost (Moderate) • Environmental - Bay (Minor) • Environmental - Noise (Moderate) • Overall RSA Improvement (Moderate)	No
	19R	south 443'					600'		7,500	7,500	7,500	7,500		
	1R	south 307'	205'	X				Remove	8,648	8,648	8,648	(8,443)		
	19L	south 307'							8,648	8,648	8,648	8,648		

Table 2-2
Runways 1L-19R and 1R-19L Refined Alternatives Comparative Matrix
San Francisco International Airport (Continued)

Refined Alternative	Rwy End	Rwy Shift/ Relocation	Displaced Threshold	Declared Distances	Bay Fill	Standard RSA	EMAS Length[1]	Twy A/A1	Available Distances (feet)[2] TORA	TODA	ASDA	LDA	Impacts	Short-Listed
R8	1L	south 304'					600'	Realign	7,500	7,500	7,500	7,500	• Operational (Minor) • Cost (Major) • Environmental - Bay (Major) • Environmental - Noise (Moderate) • Overall RSA Improvement (Minor)	Yes
	19R	south 304'			153'		600'		7,500	7,500	7,500	7,500		
	1R	north 43'					600'	Realign	8,648	8,648	8,648	8,648		
	19L	north 43'			438'		600'		8,648	8,648	8,648	8,648		
R8B	1L	south 443'	55'	X			600'	Realign	7,500	7,500	7,500	(7,445)	• Operational (Minor) • Cost (Major) • Environmental - Bay (Minor) • Environmental - Noise (Moderate) • Overall RSA Improvement (Moderate)	No
	19R	south 443'					600'		7,500	7,500	7,500	7,500		
	1R	south 354'	490'	X			600'	Realign	8,648	8,648	8,648	(8,158)		
	19L	south 354'					600'		8,648	8,648	8,648	8,648		
R9	1L	south 443'	55'	X			600'	Remove	7,500	7,500	7,500	(7,445)	• Operational (Major) • Cost (Major) • Environmental - Bay (Major) • Environmental - Noise (Moderate) • Overall RSA Improvement (Moderate)	No
	19R	south 443'					600'		7,500	7,500	7,500	7,500		
	1R	south 259'	157'	X			600'	Remove	8,648	8,648	8,648	(8,491)		
	19L	south 259'			136'		600'		8,648	8,648	8,648	8,648		
R9B	1L	south 443'	55'	X			600'	Remove	7,500	7,500	7,500	(7,445)	• Operational (Major) • Cost (Major) • Environmental - Bay (Minor) • Environmental - Noise (Moderate) • Overall RSA Improvement (Moderate)	No
	19R	south 443'					600'		7,500	7,500	7,500	7,500		
	1R	south 354'	490'	X			600'	Remove	8,648	8,648	8,648	(8,158)		
	19L	south 354'					600'		8,648	8,648	8,648	8,648		

Table 2-2
Runways 1L-19R and 1R-19L Refined Alternatives Comparative Matrix
San Francisco International Airport (Continued)

Refined Alternative	Rwy End	Rwy Shift/ Relocation	Displaced Threshold	Declared Distances	Bay Fill	Standard RSA	EMAS Length[1]	Twy A/A1	Available Distances (feet)[2] TORA	TODA	ASDA	LDA	Impacts	Short-Listed
R10	1L	south 216'				X			7,500	7,500	7,500	7,500	• Operational (Minor) • Cost (Major) • Environmental - Bay (Major) • Environmental - Noise (Moderate) • Overall RSA Improvement (Moderate)	No
	19R	south 216'			682'	X			7,500	7,500	7,500	7,500		
	1R	north 141'				X			8,648	8,648	8,648	8,648		
	19L	north 141'			936'	X			8,648	8,648	8,648	8,648		
R11	1L	south 255'				X			7,556	7,556	7,556	7,556	• Operational (Minor) • Cost (Major) • Environmental - Bay (Major) • Environmental - Noise (Moderate) • Overall RSA Improvement (Moderate)	No
	19R	south 199'		X	698'	X			7,556	7,556	7,500	7,500		
	1R	south 255'	153'	X		X			8,903	8,903	8,903	8,750		
	19L	--		X	795'	X			8,903	8,903	(8,507)	(8,507)		
R12	1L	--				X			7,500	7,500	7,500	7,500	• Operational (Minor) • Cost (Major) • Environmental - Bay (Major) • Environmental - Noise (Minor) • Overall RSA Improvement (Minor)	No
	19R	--			897'	X			7,500	7,500	7,500	7,500		
	1R	--				X			8,789	8,789	8,789	8,789		
	19L	north 141'		X	936'	X			8,789	8,789	8,648	8,648		

Source: R&A, 2010b

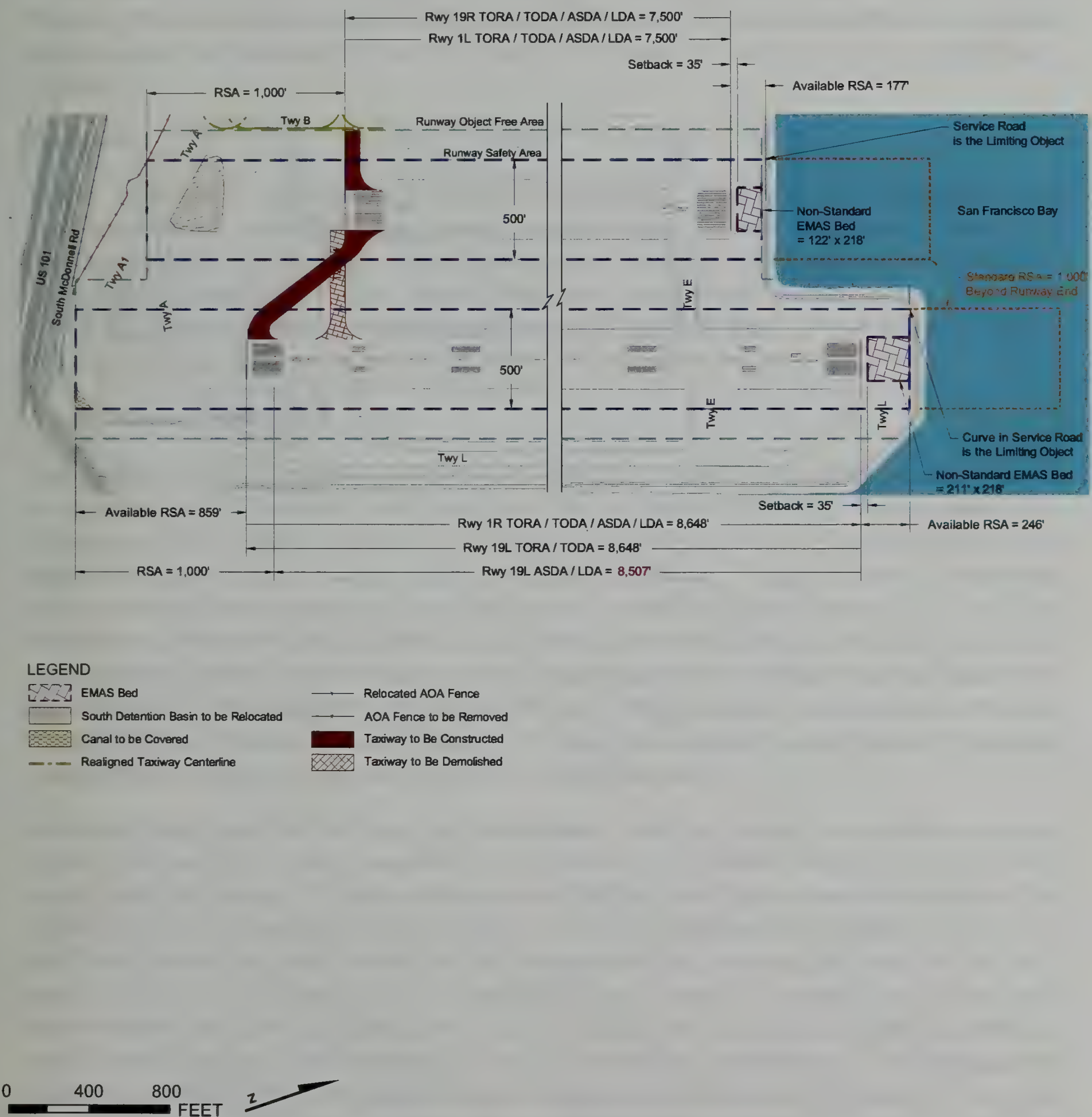
Notes:

[1] Available runway distances shown in parentheses and red font note decrease in available distances compared to existing conditions.
[2] Standard EMAS length is 600 feet is equivalent to standard RSA dimension of 1,000 feet for the design aircraft departing from SFO.

X notes this feature is included in this alternative for this runway end.

ASDA = Accelerate-Stop Distance Available
EMAS = Engineered Materials Arresting System
LDA = Landing Distance Available
RA = Refined Alternative
RSA = Runway Safety Area
Rwy = Runway
Twy = Taxiway
TODA = Takeoff Distance Available
TORA = Takeoff Run Available

RUNWAYS 1L-19R AND 1R-19L



Notes:
1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.
2. Text shown in red font is a reduction in length of an existing condition.

Source:
R&A (2010b), Exhibit 6-1 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
EMAS	Engineered Materials Arresting System
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 1L-19R AND 1R-19L
REFINED ALTERNATIVE 1

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-13

11/28/11 vsa/hk ...T:\SFO RSA\EA Jun11\Fig2-13_1-19 Alt1.ai

At the northern ends, nonstandard EMAS beds would be installed between the existing runway ends and the service roads. The limited amount of space available on the northern ends of the runways, bound by the SF Bay, would only allow for nonstandard EMAS beds, approximately 122 feet long by 218 feet wide at the Runway 19R end and 211 feet long by 218 feet wide at the Runway 19L approach (northern) end. Declared distances would be required on Runway 19L, reducing the Runway 19L ASDA and LDA from 8,648 feet to 8,507 feet.

Evaluation

Refined Alternative R1 has the least construction complexity and potential environmental impact of the short-listed refined alternatives. The runway thresholds would remain in their existing location, and nonstandard EMAS beds would be installed within available Airport property. However, given the limited improvements implemented in this alternative, Refined Alternative R1 provides limited RSA safety enhancement and does not meet the purpose and need criterion of Step 1 of the evaluation process. Therefore, this alternative was eliminated from further consideration in this EA.

2.6.2.2 Refined Alternative 4

This alternative, which is illustrated on **Figure 2-14**, attempts to maximize the available standard RSAs on the southern ends of Runways 1L-19R and 1R-19L and minimize SF Bay fill or platform area on the northern ends due to EMAS installation. The Taxiway A and A1 alignments around the southern ends would remain unchanged to maintain current operational capabilities. Taxiway M would be demolished and a crossover taxiway would be constructed to allow aircraft landing on Runway 19L to taxi to the terminal area. The South Detention Basin would be filled to meet RSA grading standards for the southern end of Runway 1L-19R. A box culvert would be constructed over the Millbrae Highline Canal for the standard RSA on the southern end of Runway 1R-19L. This alternative would reduce the threshold stagger to 141 feet between Runways 1R and 1L. The AOA fence located south of Runway 1L would be realigned further south to remain clear of the runway object-free area.

A standard EMAS bed (550 feet long by 218 feet wide) would be installed at the northern ends on Runways 19R and 19L, which is equivalent to the 1,000-foot-long standard RSA for the critical design aircraft using this runway. To minimize the amount of SF Bay fill or platform area for installation of the EMAS bed on the northern end of Runway 1R-19L, the runway would be shifted 216 feet south. The SF Bay fill or platform area would extend 281 feet beyond the current shoreline and measure 770 feet in width at the approach (northern) end of Runway 19R. The SF Bay fill or platform area required for a standard EMAS bed at the approach (northern) end of Runway 19L would extend 536 feet by 770 feet in width. Both EMAS beds would total about 7.72 acres of SF Bay fill or platform area. The vehicle service road on the northern ends of the runways would be realigned to accommodate installation of the EMAS beds. Existing runway distances would not be reduced in this alternative.

Evaluation

Refined Alternative R4 provides full RSA compliance through a combination of runway shifts, and development of standard EMAS installations on the northern end of each runway on bay fill. This alternative meets the Step 1 criterion regarding the purpose of and need for the Proposed Action.

However, due to the extended regulatory process associated with the required fill into the bay, it was concluded that this alternative could not be constructed and implemented by the December 31, 2015, deadline specified in P.L. 109-115. Therefore, this alternative did not meet the Step 2 criteria and was eliminated from further consideration in this EA.

2.6.2.3 Refined Alternative 4B

Description

This alternative, illustrated on **Figure 2-15**, is a variation of Refined Alternative R4 and attempts to maximize the available RSA on the northern ends of Runways 1L-19R and 1R-19L with the SF Bay fill or platform area. A new taxiway would connect Runways 1R and 1L to allow aircraft landing on Runway 19L to taxi to the terminal area. The South Detention Basin would be filled to meet RSA grading standards for the southern end of Runway 1L-19R. A box culvert would be constructed over the Millbrae Highline Canal for the standard RSA on the southern end of Runway 1R-19L. The existing service road would define the northern limits of the runway object-free areas. The new locations of the north runway ends would be defined by the existing service road and would provide standard EMAS beds on both runway ends. Runway 1L-19R would shift 443 feet south, and Runway 1R-19L would shift 354 feet south to accommodate the standard EMAS beds. This alternative would provide a threshold stagger of 409 feet between Runways 1R and 1L. Providing standard RSAs and runway object-free areas at the south runway ends requires the relocation of the AOA fence, South McDonnell Road, U.S. 101, and the southern portion of the Airport's property on the west side of U.S. 101. The AOA fence would be relocated between the existing U.S. 101 and South McDonnell Road alignments.

The proposed locations of the south runway ends would require the implementation of displaced thresholds. As a result, the Runway 1L LDA would be reduced from 7,500 feet to 7,445 feet, and the Runway 1R LDA from 8,648 feet to 8,158 feet. All other distances would remain unchanged. Portions of Taxiways E and L would be demolished and realigned.

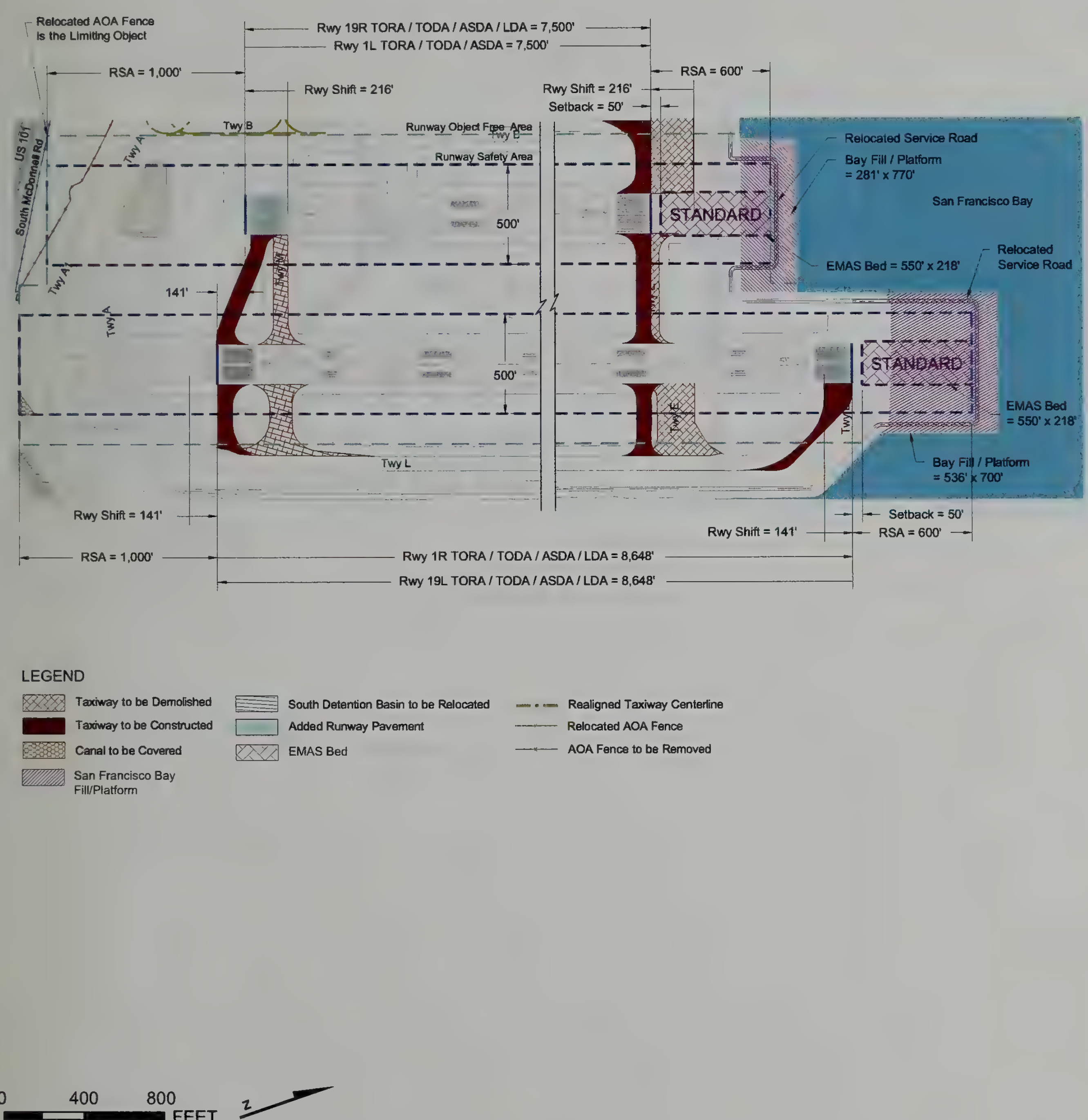
Evaluation

Refined Alternative R4B provides full RSA compliance through a combination of runway shifts and standard EMAS installations on the northern end of each runway on existing Airport property. This alternative meets the Step 1 criterion regarding the purpose of and need for the Proposed Action. However, the relocation of U.S. 101 would be prohibitively costly (approximately $750 million dollars) to implement, would require extensive design for the relocation, and would require an extended period for regulatory approval associated with potential environmental impacts to the Airport's property west of U.S. 101. Therefore, Refined Alternative R4B does not meet the Step 2 criteria regarding practicability and implementation schedule, and was eliminated from further consideration in this EA.

2.6.2.4 Refined Alternative 6

This alternative, illustrated on **Figure 2-16**, proposes the installation of nonstandard EMAS beds behind all four runway ends. The lengths of the EMAS beds would be maximized by shifting the runway south as

RUNWAYS 1L-19R AND 1R-19L



Note:
1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.

Source:
R&A (2010b), Exhibit 6-2 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
EMAS	Engineered Materials Arresting System
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 1L-19R AND 1R-19L
REFINED ALTERNATIVE 4

San Francisco International Airport
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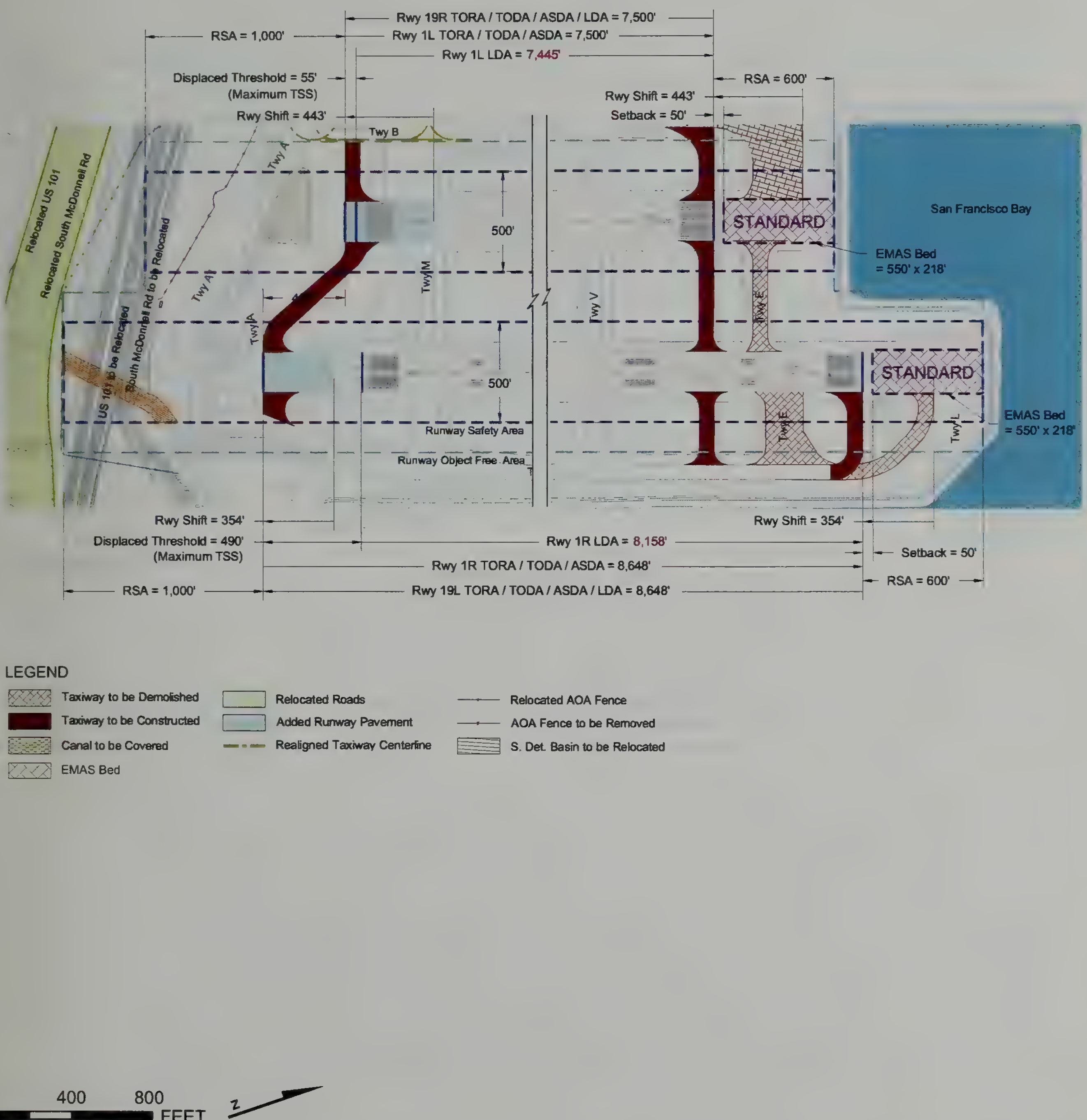
San Francisco, California

FIGURE 2-14

RUNWAYS 1L-19R AND 1R-19L



Notes:
1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.
2. Text shown in red font is a reduction in length of an existing condition.

Source:
R&A (2010b), Exhibit 6-3 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
EMAS	Engineered Materials Arresting System
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 1L-19R AND 1R-19L
REFINED ALTERNATIVE 4B

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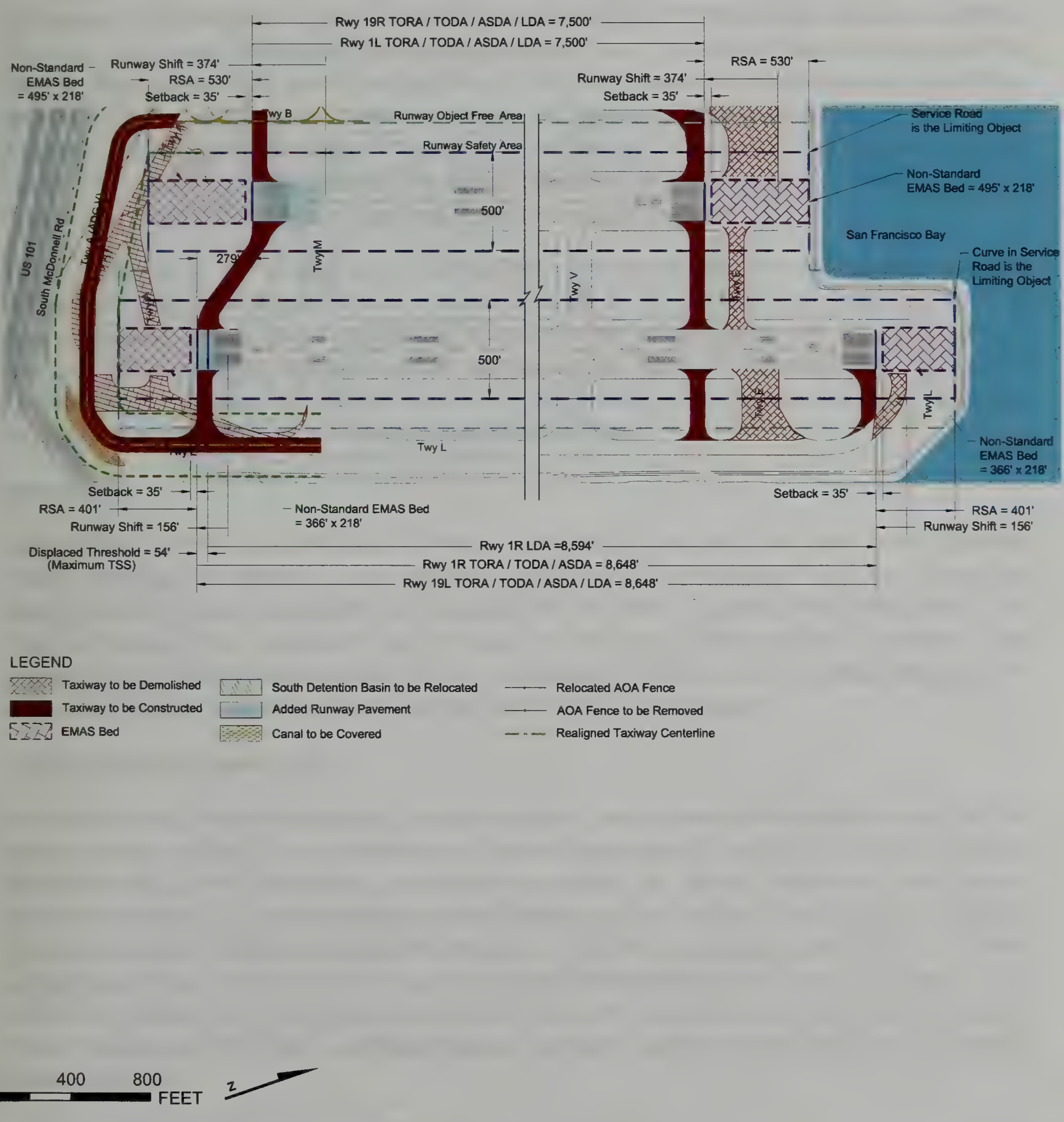
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-15

RUNWAYS 1L-19R AND 1R-19L



Notes:

1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.

Source:
R&A (2010b), Exhibit 6-4 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
EMAS	Engineered Materials Arresting System
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 1L-19R AND 1R-19L
REFINED ALTERNATIVE 6

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San Francisco, California

FIGURE 2-16

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far as the proposed realignment of Taxiway A allows, assuming the RSA is to remain clear of the runway object-free area for Taxiway A. Runway 1L-19R would shift south 374 feet, providing nonstandard EMAS beds approximately 495 feet long by 218 feet wide on either end, assuming a 35-foot setback between the runway threshold and the EMAS beds. Likewise, Runway 1R-19L would shift south 156 feet, providing nonstandard EMAS beds 366 feet long on either end. The South Detention Basin would be filled to meet standard RSA grading requirements. A box culvert would be constructed over the Millbrae Highline Canal for realignment of Taxiways A and A1, AOA fence, and the service road. A replacement crossover taxiway would be constructed to allow aircraft landing on Runway 19L to taxi to the terminal area. This alternative would provide a threshold stagger of 279 feet between Runways 1R and 1L. Additionally, the AOA fence around Runways 1L and 1R would be realigned.

At the northern ends, nonstandard EMAS beds would be installed between the existing runway ends and the service roads. The limited amount of space available on the northern ends would only allow for nonstandard EMAS beds, about 495 feet long by 218 feet wide at the Runway 19R approach (northern) end and 366 feet long by 218 feet wide at the Runway 19L approach (northern) end. Portions of Taxiways E and L, located on the northern ends of the runways, would be demolished and realigned. Existing runway distances would not be reduced in this alternative.

Evaluation

Refined Alternative R6 meets the Step 1 criterion regarding the purpose of and need for the Proposed Action. Because this alternative does not require fill into the bay or relocation of U.S. 101, it meets the Step 2 criteria regarding practicability and implementation schedule. However, FAA Order 5200.8, *RSA Program*, requires that incremental gains in safety benefits be provided "whenever possible." This alternative was therefore eliminated from further consideration in this EA in favor of similar Alternative 6A, which would include larger EMAS beds and thus provide greater safety benefit.

2.6.2.5 Refined Alternative 6A

A refinement was made to Alternative 6 following its initial development and evaluation during the RSA planning study, resulting in the development of Refined Alternative 6A, which is the Airport's preferred alternative and the Proposed Action, as described in **Section 1.3**. Several refinements were made to Alternative 6 following its initial development and evaluation during the RSA planning study, resulting in the development of Refined Alternative 6A, which is the Airport's preferred alternative and the Proposed Action, as described in **Section 1.3**. These refinements included increasing the shifts of Runway 1L-19R and 1R-19L further south to the locations shown in **Figure 1-10**, increasing the length of all four proposed EMAS installations, and adding an additional taxiway connector between and parallel to the south ends of the two runways.

Alternative 6A is depicted on **Figure 2-17**.

Evaluation

Refined Alternative R6A meets the Step 1 criterion regarding the purpose of and need for the Proposed Action. Because this alternative does not require fill into the SF Bay or relocation of U.S. 101, it meets

the Step 2 criteria regarding practicability and implementation schedule. In accordance with the requirements of FAA Order 5200.8, *RSA Program*, this alternative appears to provide the maximum practicable RSA benefits and incremental gains in aviation safety. Therefore, this alternative was carried forward to evaluation in this EA. Further refinements to Refined Alternative R6A have occurred in developing the Proposed Action which is presented on **Figures 1-5** through **1-11**.

2.6.2.6 Refined Alternative 8

This alternative, which is illustrated on **Figure 2-18**, proposes the installation of standard EMAS beds at all four runway ends, which would require filling of the bay or the construction of a platform area. To minimize the amount of fill into the bay at the northern ends of the runways, the EMAS beds on the southern ends would be installed as far south as the proposed realignment of Taxiway A allows, assuming the RSA is to remain clear of the object-free area for Taxiway A. Runway 1L-19R would be shifted south by 304 feet, and Runway 1R-19L would be shifted north by 43 feet. The South Detention Basin would be filled for installation of the standard EMAS bed south of Runway 1L-19R. A box culvert would be constructed over the Millbrae Highline Canal for realignment of Taxiways A and A1. A new crossover taxiway would be constructed to allow aircraft landing on Runway 19L to taxi to the terminal area. This alternative would provide a threshold stagger of 151 feet between Runways 1R and 1L. Additionally, the AOA fence around Runways 1L and 1R would be realigned.

Evaluation

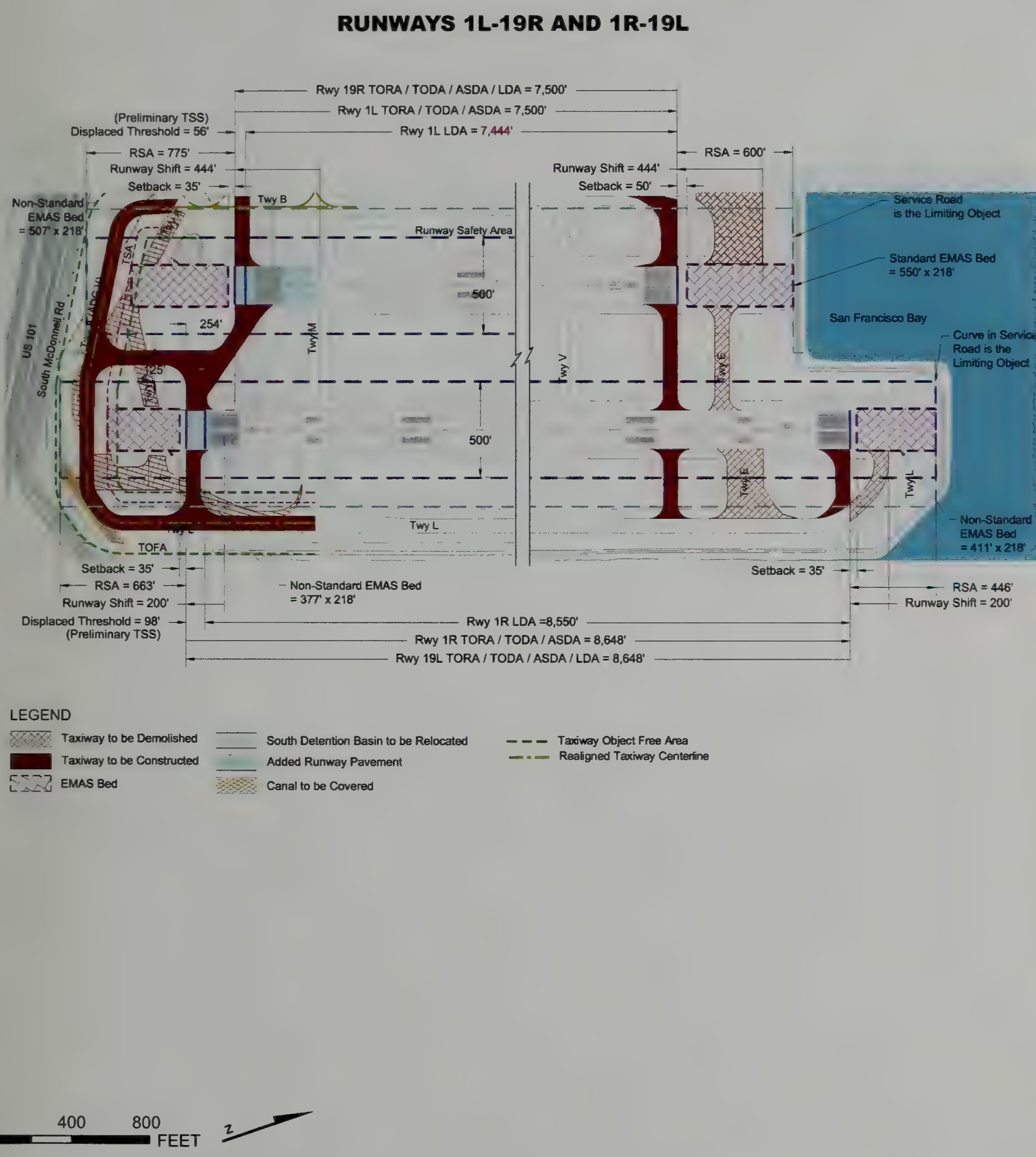
Refined Alternative R8 provides full RSA compliance through the installation of standard EMAS beds at all four runway ends and requires the relocation of Taxiway A and bay fill. This alternative meets the Step 1 criterion regarding the purpose of and need for the Proposed Action. However, due to the extended regulatory process associated with the required fill into the bay, along with current City and County policies regarding SF Bay fill, it was concluded that this alternative could not be constructed and implemented by the December 31, 2015, deadline specified in P.L. 109-115. Therefore, this alternative did not meet the Step 2 criteria and was eliminated from further consideration in this EA.

2.6.2.7 No Action Alternative

In addition to the Proposed Action, the No Action Alternative has been included in the evaluation of potential environmental consequences in this EA, as required by 40 CFR 1502.14(d). Under this alternative, none of the proposed RSA improvements would be implemented, and the Airport would not comply with the requirements of P.L. 109-115 after December 31, 2015. This alternative has been included to provide a basis for comparing the environmental consequences of the Proposed Action. The No Action Alternative (existing condition) for Runways 1R-19L and 1L-19R is provided on **Figure 1-3**. **Figure 1-4** illustrates the No Action Alternative for Runways 10R-28L and 10L-28R.

Evaluation

The No Action Alternative does not meet Step 1 criterion regarding the purpose of and need for the Proposed Action. The runways at SFO would continue to not meet FAA airport design standards. As



Note:

1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.
2. Text shown in red font is a reduction in length of an existing condition.

Source:
R&A (2010b), Exhibit ES-1 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
EMAS	Engineered Materials Arresting System
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 1L-19R AND 1R-19L
REFINED ALTERNATIVE 6A

San Francisco International Airport
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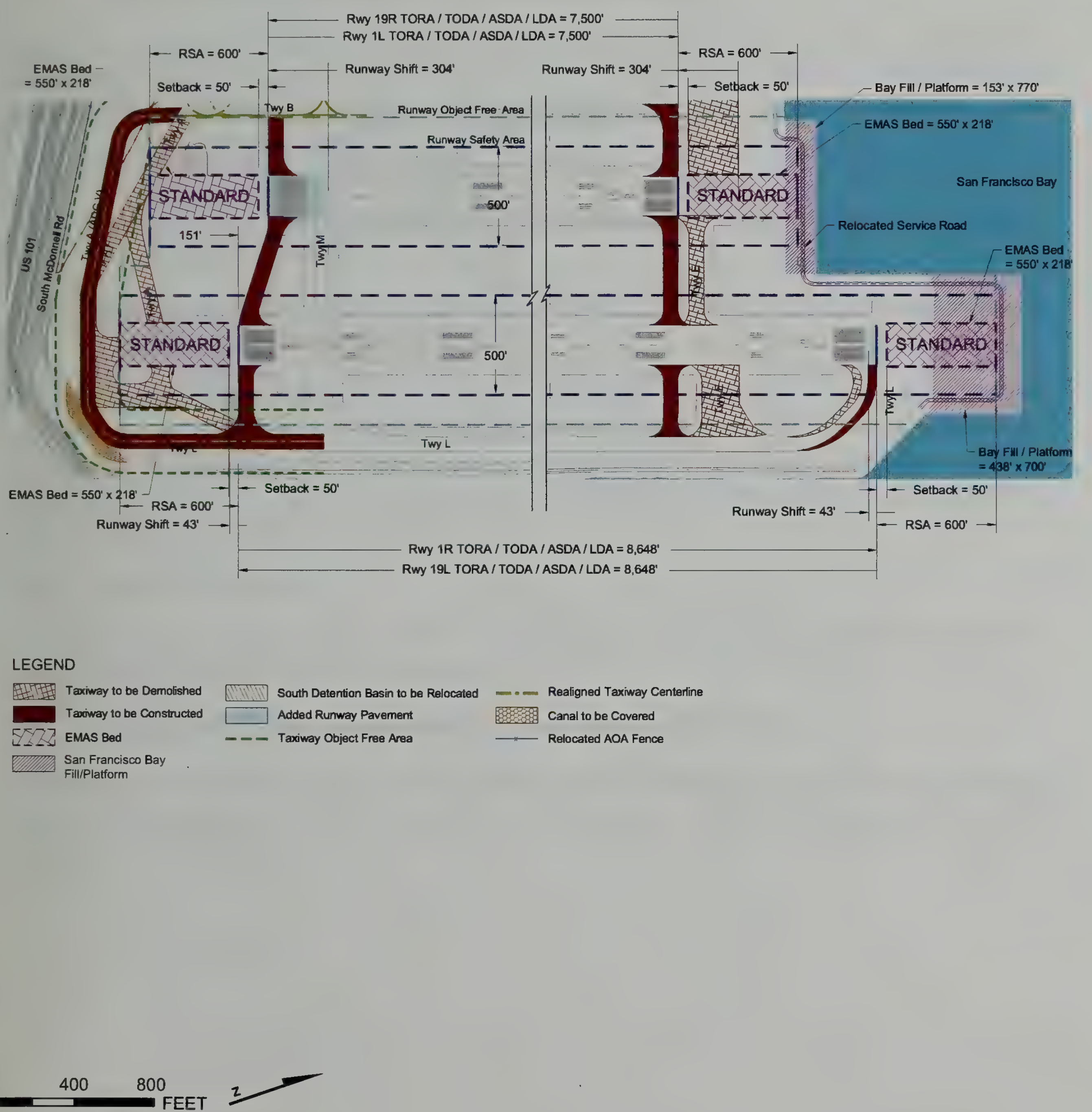
FIGURE 2-17

RUNWAYS 1L-19R AND 1R-19L



Notes:

1. Displaced threshold and declared distances are defined in Appendix B1 of this EA.

Source:
R&A (2010b), Exhibit 6-5 [Original sources: FAA Advisory Circular 150/5300, Airport Design; San Francisco International Airport; SFO Airport Basemap, SFO Facilities Division, 2007]

Acronyms and Abbreviations:

ASDA	Accelerate-Stop Distance Available
EMAS	Engineered Materials Arresting System
LDA	Landing Distance Available
RSA	Runway Safety Area
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
Twy	Taxiway

RUNWAYS 1L-19R AND 1R-19L
REFINED ALTERNATIVE 8

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 2-18

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mentioned, Council on Environmental Quality regulations require analysis of the No Action Alternative. Accordingly, this alternative did not meet the Step 1 criterion.

2.7 SUMMARY OF THE ALTERNATIVES SCREENING PROCESS

During the development of this EA, CCSF and FAA considered a wide range of both on-airport and off-airport alternatives for improving the RSA at SFO, as required by P.L. 109-115. The alternatives evaluation was conducted using a three-step process addressing the ability of each alternative to:

- Meet the purpose of and need for the Proposed Action;
- Meet the criteria of being practicable and capable of being implemented by December 31, 2015, as required by P.L. 109-115; and
- Meet the criteria of resulting in safe and efficient use of navigable airspace and minimizing impacts on airfield operations.

The alternatives screening process for this EA is summarized in **Table 2-3**. For Runways 10L-28R and 10R-28L, the use of declared distances, along with a 781-foot relocation of the Runway 10R-28L threshold to the west, has been carried forward for evaluation in this EA as part of the Proposed Action described in **Section 1.3**. For Runways 1L-19R and 1R-19L, Alternative 6A has been carried forward for evaluation in this EA as part of the Proposed Action.

2.8 PERMITS REQUIRED

As required under paragraph 405d(4) of FAA Order 1050.1E, a list of permits required for implementation of the Proposed Action is provided in **Table 2-4**.

2.9 LISTING OF FEDERAL LAWS AND REGULATIONS CONSIDERED

Table 2-5 includes a list of federal statutes, executive orders, regulations, FAA and Federal Department of Transportation orders, and FAA ACs considered in the development of the alternatives evaluation and the preparation of this EA.

Table 2-3
Summary of Alternatives Screening Process
San Francisco International Airport

Location	Alternative	Does the Alternative Pass to the Next Step? Step 1	Step 2	Step 3	Retain for Analysis in Ch 4.0?
Off-Airport	Other Modes	No			
Off-Airport	Other Airports	No			
Off-Airport	Smaller Aircraft	No			
Runway 10L-28R	Standard RSAs	Yes	No		
	Shift Runway	Yes	No		
	Reduce Runway Length	Yes	Yes	No	
	Declared Distances	Yes	Yes	Yes	Yes
	Standard EMAS	Yes	No		
Runway 10R-28L	Standard RSAs	Yes	No		
	Shift Runway	Yes	No		
	Reduce Runway Length	Yes	Yes	No	
	Declared Distances	Yes	Yes	No	
	Standard EMAS	Yes	No		
	Declared Distances with Extension	Yes	Yes	Yes	Yes
Runway 1L-19R	Standard RSAs	Yes	No		
	Shift Runway	No			
	Reduce Runway Length	Yes	Yes	No	
	Declared Distances	Yes	Yes	No	
	Standard EMAS	Yes	No		
Runway 1R-19L	Standard RSAs	Yes	No		
	Shift Runway	No			
	Reduce Runway Length	Yes	Yes	No	
	Declared Distances	Yes	Yes	No	
	Standard EMAS	Yes	No		
Runways 1L-19R and 1R-19L	Refined Alternative 1	No			
	Refined Alternative 4	Yes	No		
	Refined Alternative 4B	Yes	No		
	Refined Alternative 6	Yes	No		
	Refined Alternative 6A	Yes	Yes	Yes	Yes
	Refined Alternative 8	Yes	No		
No Action Alternative	No Action Alternative	No[1]			Yes

Notes:

[1] The No Action Alternative is retained for analysis of environmental consequences per CEQ regulations (40 CFR Part 1502.14).

CEQ = Council on Environmental Quality
CFR = Code of Federal Regulations
EMAS = Engineered Materials Arresting System
RSA = Runway Safety Area

Table 2-4
List of Permits Required for the Proposed Action
San Francisco International Airport

Issuing Agency	Permit Name/Type
Federal	
U.S. Army Corps of Engineers	Clean Water Act – Section 404 permit
U.S. Army Corps of Engineers	Rivers and Harbors Act – Section 10 permit
U.S. Fish and Wildlife Service	Federal Endangered Species Act – Biological Opinion
National Marine Fisheries Service	Endangered Species Act - Concurrence Letter for Listed Species
National Marine and Fisheries Service	Magnuson Stevens Fisheries Conservation and Management Act – Essential Fish Habitat Determination
State	
San Francisco Regional Water Quality Control Board	Clean Water Act – Section 401 permit
San Francisco Regional Water Quality Control Board	Clean Water Act – Section 402 General NPDES Stormwater permit
San Francisco Regional Water Quality Control Board	Clean Water Act – Section 402 General NPDES Stormwater permit for industrial activities.
San Francisco Bay Conservation and Development Commission	Permit Amendment or Minor Permit for consistency determination with coastal zone management
California Office of Historic Preservation	National Historic Preservation Act, Section 106 – Concurrence on Historic, Architectural, Archaeological, and Cultural Resources

Notes:

NPDES = National Pollutant Discharge Elimination System

USACE = U.S. Army Corps of Engineers

Table 2-5
List of Federal Laws and Regulations Considered
San Francisco International Airport

Federal Laws and Statutes
Subtitle VII, Title 49, U.S.C. – "Aviation Programs" (Section 40101 et seq.) recodified from, and formerly known as, the "Federal Aviation Act of 1958" as amended (P.L. 85-726)
The Airport and Airway Improvement Act of 1982 (P.L. 97-248)
Aviation Safety and Capacity Expansion Act of 1990 (P.S. 101-508, as amended)
Airport and Airway Revenue Act of 1987 (P.L. 100-223, Title IV)
The National Environmental Policy Act of 1969 (NEPA, P.L. 91-190; 42 U.S.C. §4321 et seq.)
The Clean Air Act of 1977 (as amended) (42 U.S.C. §7409 et seq.)
The Transportation, Treasury, Housing and Urban Development, the Judiciary, The District of Columbia, and Independent Agencies Appropriations Act of 2006 (P.L. 109-115)
The Noise Control Act of 1972 (P.L. 92-574; 42 U.S.C. §4901)
The Aviation Safety and Noise Abatement Act of 1979 (P.L. 96-193; 49 U.S.C. App. 2101)
Policy on lands, wildlife and waterfowl refuges, and historic sites (49 U.S.C. §303 [formerly known as Section 4(f) of the Department of Transportation Act of 1966])
Section 106, National Historic Preservation Act of 1966 (16 U.S.C. §470[f]; P.L. 89-665)
The Archaeological and Historic Data Preservation Act of 1974 (P.L. 86-253, as amended by P.L. 93-291, 16 U.S.C. §469)
The Endangered Species Act of 1973 (P.L. 85-624; 16 U.S.C. §§661, 664 note, 1008 note)
Section 404, Federal Water Pollution Control Act Amendments for 1972 (33 U.S.C. §1344; P.L. 92-500;), as amended by the Clean Water Act of 1977 (33 U.S.C. §1251; P.L. 95-217)
Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. §4601; P.L. 91-528)
Farmland Protection Policy Act (P.L. 97-98; 7 CFR Part 658)
Section 201(a), Federal Land Policy and Management Act of 1976 (43 U.S.C. §1701 et seq.; P.L. 94-579)
Resource Conservation and Recovery Act of 1976 (42 U.S.C. §6901, et seq.; P.L. 94-580, as amended by the Solid Waste Disposal Act of 1980 [P.L. 96-482]; and the 1984 Hazardous and Solid Waste Amendments [P.L. 98-616])
Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. §9601; P.L. 96-510)
Community Environmental Resource Facilitation Act (42 U.S.C. §9601, et seq.)
Executive Orders
Executive Order 11593, *Protection and Enhancement of the Cultural Environment* (dated May 13, 1971)
Executive Order 11988, *Floodplain Management* (43 Federal Register [FR] 6030) and U.S. Department of Transportation (DOT) Order 5650.2 – *Floodplain Management and Protection* (dated April 23, 1979)
Executive Order 11990, *Protection of Wetlands* and Order DOT 5660.1A, *Preservation of the Nation's Wetlands* (dated August 24, 1978)
President's 1979 Environmental Message Directive on Wild and Scenic Rivers (dated August 2, 1979)

Table 2-5
List of Federal Laws and Regulations Considered
San Francisco International Airport (Continued)

Executive Order 11514, *Protection and Enhancement of Environmental Quality* (dated March 4, 1970)
Executive Order 11296, *Flood Hazard Evaluation Guidelines*
Executive Order 12898, *Federal Actions Address Environmental Justice in Minority Populations and Low-Income Populations*
Federal Regulations
40 CFR Parts 1500-1508, *CEQ implementation of NEPA procedural provisions, establishes uniform procedures, terminology, and standards for implementing the procedural requirements of NEPA's section 102(2)*
14 CFR Part 95, *Instrument Flight Rules Altitudes*
36 CFR Part 800 (39 Federal Regulation [FR] 3365, January 25, 1974, and 51 FR 31115, September 2, 1986), *Protection of Historic Properties*
7 CFR Part 657 (43 FR 4030, January 31, 1978), *Prime and Unique Farmlands*
49 CFR Part 24 (March 2, 1989), *Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs*
14 CFR Part 36, *Noise Standards Type and Airworthiness Certificates*
14 CFR Part 75, *Establishment of Jet Routes and Area High Routes*
14 CFR Part 77, *Objects Affecting Navigable Airspace*
14 CFR Part 91, *General Operations and Flight Rules*
14 CFR Part 97, *Standard Instrument Approach Procedures*
14 CFR Part 139, *Airport Operations Specifications*
14 CFR Part 150, *Airport Noise Compatibility Planning*
14 CFR Part 151, *Federal Aid to Airports*
14 CFR Part 152, *Airport Aid Program*
14 CFR Part 153, *Acquisition of U.S. Land for Public Airports*
14 CFR Part 154, *Acquisition of U.S. Land for Public Airports under the Airport and Airway Development Act of 1970*
14 CFR Part 155, *Release of Airport Property from Surplus Property Disposal Restrictions*
14 CFR Part 157, *Notice of Construction, Alteration, Activation, and Deactivation of Airports*
14 CFR Part 169, *Expenditures of Federal Funds for Non-Military Airports or Air Navigational Facilities Thereon*
FAA/U.S. Department of Transportation Orders
DOT Order 5610.1C, *Procedures for Considering Environmental Impacts* (44 FR 56420, October 1, 1979) and Order DOT 5610.1C, Change 1 (July 13, 1982)
DOT Order 5660.1, *Preservation of the Nation's Wetlands*
FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures,* Change 1 (March 20, 2006)

Table 2-5
List of Federal Laws and Regulations Considered
San Francisco International Airport (Continued)

FAA Order 5050.4B, *National Environmental Policy Act Implementing Instructions for Airport Actions*
FAA Order 5200.5A, *FAA Guidance Concerning Sanitary Landfills on or Near Airports*
FAA Order 5200.8, *Runway Safety Area Program*
FAA Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Materials Arresting Systems*
FAA Joint Order 7110.65T, *Air Traffic Control*
FAA Advisory Circulars
AC 150/5020-1, *Noise Control and Compatibility Planning for Airports*
AC 150/5070-6B, *Airport Master Plans*
AC 150/5070-7, Airport System Planning Process
AC 150/5150-2B, *Federal Surplus Personal Property for Public Airport Purposes*
AC 150/5200-33B, *Hazardous Wildlife Attractants On or Near Airports*
AC 150/5220-22A, *Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns*
AC 150/5300-13, *Airport Design*
AC 150/5320-6E, *Airport Pavement Design and Evaluation*
AC 150/5370-10E, *Standards for Specifying Construction of Airports*
AC 70/7460-21, *Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace*
AC 91-53A, *Noise Abatement Departure Profile*

Notes:

AC = Advisory Circular
CEQ = Council on Environmental Quality
CFR = Code of Federal Regulations
DOT = U.S. Department of Transportation
FAA = Federal Aviation Administration
FR = Federal Register
NEPA = National Environmental Policy Act
U.S.C. = United States Code

CHAPTER 3.0
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter provides a description of the existing conditions within the study area (see Section 3.1.1). The environmental resource categories are organized as identified in Federal Aviation Administration (FAA) Order 1050.1E, *Environmental Impacts: Policies and Procedures* (FAA, 2006a) and FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions* (FAA, 2006b). The potential environmental impacts of the No Action and Proposed Action alternatives retained for analysis of environmental consequences are presented in **Chapter 4.0**, Environmental Consequences, of this Environmental Assessment (EA).

The following environmental resource categories are not present in the study areas and therefore would not be affected by the No Action or Proposed Action alternatives: Farmlands, Wild and Scenic Rivers, and Coastal Barriers. The nearest protected farmlands are 3 miles west and north of the Airport (CDOC, 2008; USDA, 2004). The American (Lower) River in Sacramento, approximately 60 miles northeast of the Airport, is the closest Wild and Scenic River segment (National Wild and Scenic Rivers, 2011). There are no coastal barrier islands in the vicinity of San Francisco Bay (SF Bay). Therefore, in accordance with guidance provided in FAA Orders 5050.4B and 1050.1E, no further analysis of these resources is provided within this EA.

3.1.1 STUDY AREAS AND STUDY YEARS

For the purposes of describing the existing conditions in the vicinity of the Airport, two study areas were developed for this EA, including a Generalized Study Area (GSA) and an Area of Potential Effect (APE). These study areas are shown in **Figure 3.1-1**. Some resource categories have used specific assessment areas appropriate to those topics. Examples include noise and historic architecture. The specific assessment areas for these topics are defined in applicable sections of the EA.

3.1.1.1 Generalized Study Area

The GSA presented on **Figure 3.1-1** includes a geographic area that was established to quantify impacts that may occur from various resource categories including air quality, surface transportation, and land use. In light of the limited physical area of direct disturbance, and the fact that the Proposed Action would not substantially change aircraft operations at SFO, the GSA was defined to include the Airport property, a limited area of off-airport property east of El Camino Real, and that area of San Francisco Bay studied for the biological resources, as described in **Section 3.8**.

3.1.1.2 Area of Potential Effect

A detailed study area, called an APE in this EA, is defined as the geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties (36 Code of Federal Regulations [CFR] § 800.16(d)). These changes may include physical destruction, damage, or alteration of a property; change in the character of the property's use or of physical features within its setting that contributes to its historic significance; and introduction of visual, atmospheric, or audible elements that diminish the

integrity of the property's significant historic features (36 CFR §800.5(a)(2)). For the EA the location of various known historic properties within the project vicinity were carefully considered. As presented on **Figure 3.1-1,** four noncontiguous areas make up the APE and are located at the ends of the 1-19 and 10-28 runway systems: north (the north approach ends of Runways 19L and 19R), south (the south approach ends of Runways 1L and 1R), east (the east approach of Runways 28L and 28R), and west (the west approach of Runways 10L and 10R). Detailed descriptions of the APEs are included in **Section 3.12.2**. Runway Status Lights would be added on the existing pavement on the runway ends and associated taxiways. There would be no new ground disturbance associated with the Runway Status Lights.

3.1.1.3 Study Years

The baseline year used to identify existing conditions in **Chapter 3.0** of this EA is 2010. Two future years, 2015 and 2020, were selected for analysis of potential impacts of the Proposed Action Alternative. The first year that all of the proposed San Francisco International Airport (SFO or the Airport) Runway Safety Area (RSA) Program improvements would be constructed and in use would be 2015, and 2020 would be the 5-year future horizon normally used in FAA environmental documents.

3.2 NOISE

This section addresses the existing (2010) aircraft noise environment in the area surrounding SFO and the methodology used to determine existing aircraft noise exposure. The terms and metrics associated with aircraft noise used in the noise analysis described in this section are complex, and are described in detail in **Appendix C1**.

3.2.1 AIRCRAFT NOISE DESCRIPTION AND METHODOLOGY

California law mandates use of the Community Noise Equivalent Level (CNEL), and the FAA recognizes CNEL as an alternative metric for California (California Code of Regulations, Title 21, Division 2.5, Chapter 6; FAA Order 1050.1E in Appendix A, Section 14.1 [FAA, 2006a]). Additional information regarding CNEL is included in **Appendix C1**. CNEL contours are a graphical representation of the distribution of noise over the surrounding area from the Airport's average annual daily aircraft operations.

CNEL is a 24-hour time-weighted average noise metric, expressed in A-weighted decibels (dBA) that accounts for the noise levels of individual aircraft events, the number of times those events occur, and the time of day they occur. CNEL is measured for three time periods: daytime (7:00 a.m. to 6:59 p.m.), evening (7:00 p.m. to 9:59 p.m.), and nighttime (10:00 p.m. to 6:59 a.m.). To represent the added intrusiveness of sounds during evening and nighttime hours, CNEL adds weights of 4.77 dBA and 10 dBA to events occurring during the evening and nighttime periods, respectively, compared to the day-night noise level (Caltrans, 2002). The FAA defines CNEL 65 as the threshold of noise compatibility for residential land uses in California.

In accordance with guidance contained in FAA Order 1050.1E, detailed noise analyses must be performed through noise modeling using an FAA-approved model. The FAA's Integrated Noise Model (INM), Version 7.0b, released September 30, 2009, was the most recent version of the INM at the time this EA was prepared, and was used for the aircraft noise exposure analysis documented in this EA. The INM has been the FAA's standard noise modeling tool for predicting noise levels in the vicinity of airports since 1978.

Source
Aerial Photo, SFO, June 2009

GENERAL STUDY AREA

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 3.1-1

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The INM incorporates the number of annual average daily daytime, evening, and nighttime aircraft operations, flight paths, and flight profiles of the aircraft, along with its extensive internal database of aircraft noise and performance information, to calculate the CNEL at many points on the ground around an airport. From a grid of points, the INM contouring program draws contours of equal CNEL that can be superimposed onto land use maps. For this EA, three ranges of CNEL noise contours were developed: CNEL 65 to 70, CNEL 70 to 75, and CNEL 75 and higher.

The current aircraft operational levels were derived from the FAA Terminal Area Forecast (FAA, 2010a) and data from the FAA's Airport Traffic Control Tower (ATCT). The flight profiles used in this EA are not custom, but a more appropriate use of the standard Stage Lengths 1 through 9 as defined in the INM based on the actual profiles flown. The FAA approved the use of adjusted stage lengths for the Boeing 737-3/4/5, 777, and MD80 aircraft to be consistent with the ongoing Noise Exposure Maps update project, where the stage lengths were adjusted to reflect heavier aircraft loads. The data and methodologies used to develop the noise contours are provided in **Appendix C2**. A copy of the letter from the FAA approving the flight profiles used is included in **Appendix C3.**

3.2.2 2010 (Existing) Noise Environment

The existing noise environment in the area surrounding SFO was evaluated based on the number of aircraft operations at the Airport in 2010, the existing condition year, and the associated airport operational characteristics.

3.2.2.1 CNEL Contours

Based on the operational conditions presented in Section 3.2.2 above, noise contours were developed using the INM. Noise exposure resulting from 2010 aircraft operations at SFO is depicted on **Figure 3.2-1** as CNEL 65, 70, and 75 dBA contours, superimposed over an aerial photograph. Sensitive land uses and noise-sensitive sites within the existing CNEL 65 dBA or greater noise contours are listed in **Table 3.2-1**.

3.2.2.2 Land Use Compatibility

Title 14 CFR Part 150 land use compatibility guidelines (see **Table 4.3-1**) do not represent a federal determination that a specific land use is acceptable or unacceptable under federal, state, or local laws. The responsibility for determining acceptable land uses rests with local authorities through zoning laws and ordinances.

The noise exposure is quantified as numbers of noise sensitive sites, and numbers of people and housing units exposed to various levels of aircraft noise. The number of sensitive sites, housing units, and population around SFO exposed to CNEL 65+ dBA for existing (2010) conditions, are presented in **Table 3.2-1**. As shown on **Figure 3.3-1**, the area around the Airport consists of several types of land uses, including residential, industrial, and commercial land uses. According to FAA Order 1050.1E, the variables to be analyzed include: 1) the number of people living or residences within each noise contour at or above day-night average sound level 65 dBA (or CNEL 65 dBA), including the net increase or decrease in the number of people or residences exposed to that level of noise; 2) the location and

number of noise sensitive land uses (e.g., schools, churches, hospitals, parks, or recreation areas) exposed to CNEL 65 or greater; and 3) mitigation measures in effect or proposed and their relationship to the proposal.

The FAA defines CNEL 65 as the threshold of noise compatibility for residential land uses in Table 1 of Title 14 CFR Part 150. Under existing (2010) conditions, approximately 4,707 housing units, representing 13,177 people, are located within the CNEL 65 to 70 dBA contour, and approximately 960 housing units, representing 3,188 people, are located within the CNEL 70 to 75 dBA contour.

3.2.3 EXISTING NOISE MANAGEMENT PROGRAM

SFO has one of the most extensive home insulation programs in the nation and is currently operating without a variance under the California Airport Noise Standards (Title 21) (Code of Regulations, Title 21, Section 5000 et seq.). Dating from 1983, more than 15,000 homes, eight churches, and seven schools have been treated in six geographic areas: the County of San Mateo, and the cities of Daly City, Millbrae, Pacifica, San Bruno, and South San Francisco. The total program expenditure currently totals more than $153 million. The program is currently administered by the Airport, which decides in what order eligible properties will be treated. The Airport determines whether or not to include public buildings, multifamily residential buildings, and/or rental properties. The program is funded through a combination of FAA and Airport funds distributed through the City and County of San Francisco. FAA guidelines set the standard for eligibility for federal funds as noise sensitive properties within the accepted CNEL 65 dBA annual noise contour.

3.3 COMPATIBLE LAND USE

This section describes existing and planned land use in areas surrounding the Airport. The land use information included in this section is derived from the Compatible Land Use Plan (CLUP) for San Mateo County Airports (City/County Association of Governments, 1996) as well as the general plans and zoning ordinances of the jurisdictions in the Airport area.

3.3.1 EXISTING LAND USE

Figure 3.3-1 shows existing land use for the GSA as well as the areas around the Airport. The Airport extends into the SF Bay to the east and is generally bordered by U.S. Highway 101 (U.S. 101) to the west and south. The Airport is surrounded by the cities of Millbrae and Burlingame (south), San Bruno (west), and South San Francisco (north). Existing land use patterns in these areas vary by jurisdiction. Immediately west of the Airport, within the City of San Bruno, land use is dominated by single-family residential use with commercial uses concentrated along San Mateo Avenue and El Camino Real. This land use pattern continues southward into the City of Millbrae, with an increase in multi-family residential use in areas southwest of the Airport. Large areas of commercial and light industrial land use can be found southeast of the Airport in the City of Burlingame.

Table 3.3-1 identifies noise-sensitive uses in the vicinity of the GSA. All noise-sensitive land uses identified are within the cities of San Bruno and Millbrae; these include four schools, a public library, nine religious facilities, a convalescent hospital, and seven parks.

LEGEND

- 65 dB CNEL
- 70 dB CNEL
- 75 dB CNEL
- General Study Area

Source:
Aerial Photo, NAIP, 2009

Acronyms and Abbreviations:
CNEL = Community Noise Equivalent Level
dB = decibel

N

0 4,000 8,000 FEET

EXISTING CNEL CONTOURS (2010)

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 3.2-1

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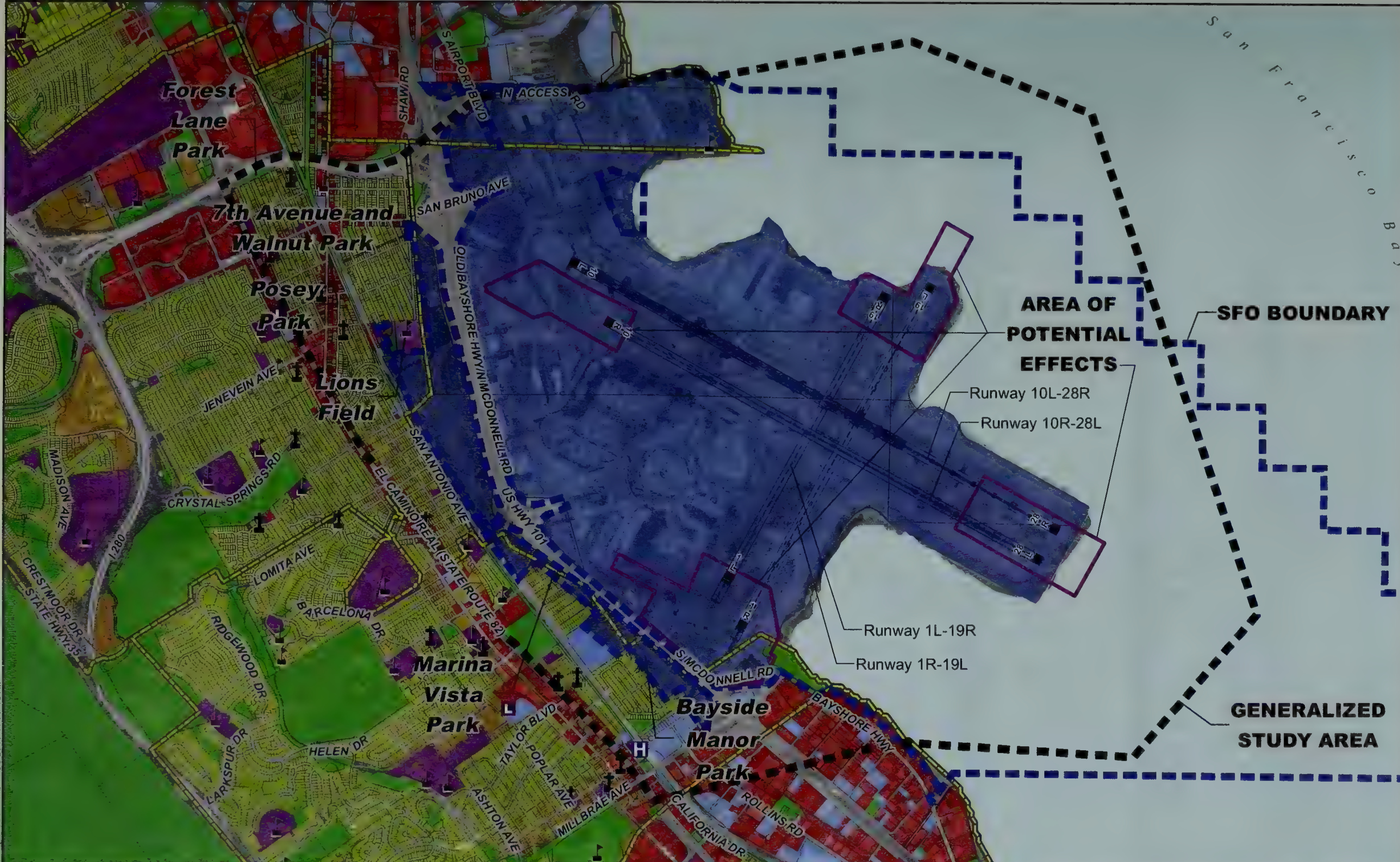

LEGEND

Church	Single-Family Residential
Hospital	Multi-Family Residential
Library	Commercial
School	Industrial
	Airport
	Public Use
	Park/Open Space
	Undetermined
	Area of Potential Effects
	Generalized Study Area
	Airport Boundary
	City Boundary

Sources:
Aerial Photo, SFO, June 2009; Existing Land Use derived from San Mateo County, Planning and Development Division, North County Area San Mateo County General Plan, Land Use, July 2009; City of Burlingame, General Plan, April 2000; City of Millbrae, General Plan, November 2008; City of South San Francisco, General Plan, 1999; City of San Bruno, General Plan, December 2008 - Prepared by: Ricondo & Associates, Inc., February 2011; and USGS GNIS, 2011. San Mateo County Active_Parcels_APN, May 2010.

N

0 1,500 3,000 FEET

GENERALIZED EXISTING LAND USE

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 3.3-1

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Table 3.2-1
Noise Sensitive Sites, Population, and Housing Units within Existing (2010) CNEL Contours

	CNEL Contours			
	CNEL 65 to 70 dBA	CNEL 70 to 75 dBA	CNEL 75+ dBA	Total Over CNEL 65 dBA
Number of Noise Sensitive Sites (Nonresidential)				
Church	1	---	---	1
Park	7	3	---	10
School	6	1	---	7
Total Noise Sensitive Sites	**14**	**4**	**---**	**18**
Population and Housing Unit Estimates				
People	13,177	3,188	---	16,366
Housing Units	4,707	960	---	5,667

Note: Numbers may not add due to rounding
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibel.

Table 3.3-1
Noise Sensitive Land Uses within the Generalized Study Area
San Francisco International Airport

Facility	City	Type of Use
Belle Air Elementary	San Bruno	School
Lomita Park Elementary School	San Bruno	School
San Bruno Public Library	San Bruno	Library
Free Life Church	San Bruno	Church
St. Bruno's Catholic Church	W. San Bruno	Church
St. John's Evangelical Church	San Bruno	Church
Sanatan Mandir	San Bruno	Church
Our Lady of Lebanon Eastern Catholic Church	Millbrae	Church
Millbrae Serra Convalescent Hospital	Millbrae	Convalescent Hospital
Bay Front Park	Millbrae	Park
Bayside Manor Park	Millbrae	Park
Marina Vista Park	Millbrae	Park
Lions Field	San Bruno	Park
Seventh Avenue Park	San Bruno	Park
Seventh Avenue and Walnut Park	San Bruno	Park
Forest Lane Park	San Bruno	Park
Posey Park	San Bruno	Park

Sources: County of San Mateo Information Services Department; San Bruno Park School District; City of Millbrae Parks and Recreation Department; City of San Bruno Parks Division, 2011.

All four of the jurisdictions intersected by the GSA boundary have adopted zoning ordinances that provide for a variety of zoning districts and permissible uses within areas around the Airport. As areas around the Airport have mostly been fully developed for some time, zoning in these areas is consistent with existing land use as depicted on **Figure 3.3-1**.

3.3.2 Local Plans and Land Use Regulations

The general plans for each of the jurisdictions intersected by the GSA boundary provide land use guidance for future development in areas around the Airport. The following sections describe planned land use for San Mateo County and the cities of San Bruno, Millbrae, and Burlingame. The City of South San Francisco is not within the GSA, and is not discussed in this section. The Compatible Airport Land Use Plan for San Mateo County, which sets forth compatible land use policies for development around the Airport, is also discussed below.

3.3.2.1 San Mateo County

The San Mateo County General Plan was adopted in November 1986 (County of San Mateo, 1986). As previously stated, the Airport, while owned and operated by the City and County of San Francisco (CCSF), is situated on land in unincorporated San Mateo County. The San Mateo County General Plan identifies the area of the Airport as planned for airport uses and no change in land use is anticipated.

3.3.2.2 City of San Bruno

The City of San Bruno updated its General Plan and adopted it in 2009 (City of San Bruno, 2009). In general, areas within the City of San Bruno and in the GSA are fully developed and planned land use is consistent with existing land use. Land use patterns are primarily focused on low-density residential use, with commercial use along the San Mateo Avenue and El Camino Real corridors. The general plan identifies "Transit Oriented Development" as a planned land use along San Bruno Avenue. Mixed residential and commercial uses are planned for the downtown area and adjacent corridors, collectively called the Transit Corridors Plan area.

3.3.2.3 City of Millbrae

The City of Millbrae lies to the southwest of the Airport. The City adopted its General Plan in 1998. Portions of the City of Millbrae that are in the GSA are fully developed, and planned land use for these areas is consistent with existing land use. The General Plan land use map identifies park and open space use alongside the U.S. 101 corridor, beyond which lies low-density residential use with commercial uses focused on the El Camino Real corridor.

The Millbrae Station Area Specific Plan (City of Millbrae, 1998), adopted in 1998, encompasses an area surrounding the Millbrae Intermodal Station between U.S. 101 and El Camino Real. Planned land use in this area is focused on "Transit Oriented Development," featuring areas of commercial, residential, and mixed use. The Specific Plan policies call for an increase in both intensity and residential density over what may currently exist in areas around the station.

3.3.2.4 City of Burlingame

The City of Burlingame lies to the south of the Airport and the City of Millbrae. The City of Burlingame General Plan was first adopted in 1969 (City of Burlingame, 1969), and its various elements have subsequently been updated at various times over the last 40 years. The General Plan land use map for the city was last updated in 2000. Planned land use in areas of Burlingame adjacent to the Airport are for industrial and office use. This is consistent with the existing land use pattern, and changes in land use in this part of Burlingame are not anticipated.

3.3.2.5 San Mateo County Comprehensive Land Use Plan

The City/County Association of Governments of San Mateo County acts as the Airport Land Use Commission (ALUC) for San Mateo County. The California State Aeronautics Act (California Public Utilities Code, § 21670 et seq.) requires the ALUC to prepare an Airport Land Use CLUP for all public use and military airports within its jurisdiction. CLUPs establish land use compatibility criteria for areas around airports based on three compatibility factors: noise, safety, and airspace protection. Jurisdictions with planning authority within areas covered by the CLUP are required to ensure that their planning documents and zoning ordinances are consistent with the CLUP, or to take specific steps to override the document.

The current CLUP, adopted in December 1996 and amended in 1998, covers areas around Half Moon Bay Airport, San Carlos Airport, and SFO. An update of the CLUP is currently being prepared by the ALUC.

3.4 DEPARTMENT OF TRANSPORTATION ACT, SECTION 4(f) AND LAND AND WATER CONSERVATION FUND ACT, SECTION 6(f) RESOURCES

Section 4(f) of the U.S. Department of Transportation Act of 1966, as amended (49 United States Code [U.S.C.] 303, and 23 U.S.C. 138) requires a Section 4(f) analysis of any federally funded transportation project if the project proposes to use property from a publicly owned park, recreation area, wildlife or waterfowl refuge area, or any significant historic site. The Secretary of Transportation may approve a transportation project requiring the use of Section 4(f) land only if:

- There is no prudent and feasible alternative to using that land; or
- The program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuges, or historic sites resulting from the use.

For Section 4(f) purposes, use also includes not only actual physical takings of Section 4(f) lands but also adverse indirect impacts, or constructive use. Constructive use only occurs if Section 4(f) lands are substantially impaired by a project action, which includes substantially diminishing the activities, features, or attributes of the Section 4(f) resource that contribute to its significance or enjoyment.

Section 6(f) of the National Park Service (NPS) Land and Water Conservation Fund (LWCF) Act contains provisions for the protection of federal investments in land and water resources. The LWCF Act discourages the conversion of parks or recreational facilities to other uses.

3.4.1 PUBLIC LANDS LOCATED WITHIN THE GSA

The GSA includes several city parks that are Section 4(f) resources. **Figure 3.3-1** shows the locations of these parks within the GSA. There are three parks in the City of Millbrae within the GSA, including Bayside Park, Bay Front Park, and Marina Vista Park. Five parks in the City of San Bruno are located within the GSA, including Lions Field, Seventh Avenue, Walnut Park, Forest Land Park, and Posy Park (USGS, 2011). Of the total eight parks, five are located west of U.S. 101.

According to information published on historic properties from CCSF, on the NPS National Register Information System, from the State of Office Historic Preservation's California Register of Historical Resources (CRHR), and from the Northwest Information Center, no known historical properties are present within the APE.

No parks or recreation facilities in the GSA have received grants from the LWCF. No parks or recreational areas would be converted for Airport use under the Proposed Action Alternative, and therefore Section 6(f) would not apply.

3.5 DEMOGRAPHIC, SOCIOECONOMIC, AND TRANSPORTATION CHARACTERISTICS

This section describes existing economic and demographic conditions and transportation characteristics of the GSA. Socioeconomic issues relevant to the evaluation of environmental impacts include population, ethnicity of population and poverty status, employment, income and housing distribution, surface transportation and traffic, children's environmental health and safety, and public services.

3.5.1 POPULATION

Census tracts within the GSA and surrounding cities are presented in **Figure 3.5-1** and listed in **Table 3.5-1**. **Table 3.5-1** shows historical and projected population trends from 1990 through 2020 in the cities of Millbrae, San Bruno, South San Francisco, and Burlingame, and San Mateo County. The population growth experienced in these cities between 1990 and 2010 ranges from 5 to 17 percent. San Mateo County's population is expected to grow from 718,451 persons to 801,305 persons between 2010 and 2020, which represents a 12 percent growth in population. The population growth in the census tracts within the GSA increased by 6 to 30 percent between 1990 and 2010. U.S. 2010 Census information was used for 1990 through 2010 population counts. Association of Bay Area Governments projections for 2015 and 2020 were used in this EA.

3.5.2 ETHNICITY OF POPULATION AND POVERTY STATUS

The race and poverty data in 2000 for the GSA are shown in **Table 3.5-2**. Race and poverty data for 2010 was unavailable from the U.S. Census Bureau when this EA was prepared. Census tracts within the GSA have a wide range of percentages of minority populations. GSA census tracts 6023, 6041.01, and 6042, have minority population percentages greater than 50 percent, while census tract 6051 is the lowest, with a 23 percent minority population. Census tracts 6041.01 and 6023 have the highest percentage of population living below the poverty level, 8 and 7 percent, respectively. Approximately 4 percent of the population of census tracts 6042 and 6044 are living below the poverty level; these are the lowest in the GSA (U.S. Census Bureau, 2000).

CENSUS TRACTS WITHIN THE GENERAL STUDY AREA

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 3.5-1

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Table 3.5-1
Historical and Projected Population

Area	Population					Growth 1990 – 2010
	1990[1]	2000[1]	2010[1]	2015[2]	2020[2]	
Burlingame	26,801	28,158	28,806	30,902	32,617	7%
Millbrae	20,412	20,718	21,532	22,608	23,606	5%
San Bruno	38,961	40,165	41,114	45,606	45,609	6%
South San Francisco	54,312	60,552	63,632	66,596	69,691	17%
San Mateo County	649,623	707,161	718,451	766,891	801,305	11%
Census Tract 6023	3,123	3,204[2]	3,611[2]	4,741[2]	5,608[2]	16%
Census Tract 6041.01	6,795	7,679[2]	7,940[2]	8,389[2]	9,233[2]	17%
Census Tract 6042	3,465	4,257[2]	4,512[2]	4,855[2]	5,408[2]	30%
Census Tract 6044	4,185	3,945[2]	4,416[2]	5,003[2]	5,665[2]	6%
Census Tract 6051	2,762	2,927[2]	2,971[2]	3,329[2]	4,190[2]	8%

Sources: U.S. Census Bureau, 1990; 2000; Association of Bay Area Governments, Projections 2009, San Mateo County, August 2009 (downloaded June 10, 2011).

Notes:

1 U.S. Census data
2 Estimated by the Association of Bay Area Governments

GSA = Generalized Study Area

Table 3.5-2
Race and Poverty Data in 2000

Area	Population	Minority Population[1]	Percentage Minority[2]	Population Living Below Poverty Level[2]	Population for whom Poverty Status is Determined	Percentage Living Below Poverty Level[2]
Burlingame	29,171	6,680	23%	1,611	28,734	6%
Millbrae	20,736	7,665	37%	688	20,416	3%
San Bruno	40,159	16,993	42%	1,779	39,948	4%
South San Francisco	60,545	33,866	56%	3,159	60,092	5%
San Mateo County	707,161	286,478	41%	40,692	697,649	6%
Individual Census Tracts Within the GSA						
Census Tracts 6023	3,204	1,709	53%	210	3,164	7%
Census Tracts 6042	4,257	2,514	59%	179	4,204	4%
Census Tracts 6041.01	7,679	3,946	51%	597	7,589	8%
Census Tracts 6044	3,945	1,600	41%	132	3,693	4%
Census Tracts 6051	2,927	668	23%	152	2,904	5%

Source: U.S. Census Bureau, 2000.

Notes:

2010 census data for race and poverty has not yet been released.

1 The minority population represents the number of residents that, in 2000, were included in the following race or ethnicity categories (defined by the U.S. Census): White Hispanic/Latino, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, Some Other Race, and Two or More Races.

2 Low-income percentage represents the number of residents living below the poverty level, based on their 1999 income, taken as a percentage of the population for whom poverty status is determined (which includes all persons except institutionalized persons, persons in military group quarters and in college dormitories, and unrelated individuals under 15 years old).

GSA = Generalized Study Area

3.5.3 EMPLOYMENT

Unemployment rate trends and projections for San Mateo County and California are shown in **Table 3.5-3**. As shown in **Table 3.5-3**, from 2000 to 2010 there was a 5 percent increase in unemployment in San Mateo County. The State of California Department of Finance forecast indicates the unemployment rate is expected to decrease over the next 10 years.

Table 3.5-3
Unemployment Rate Trends and Projections

Year	San Mateo County	State
2000	3.6%	4.9%
2010[1]	8.6%	12.0%
2020[1]	4.7%	6.1%

Source: State of California Department of Finance, 2007.

Note:

1 Forecast

3.5.4 INCOME AND HOUSING DISTRIBUTION

Table 3.5-4 presents median household incomes in the GSA. In 2010, census tract 6041.01 had the lowest median household income ($66,474), and census tract 6051 had the highest median household income ($100,429) (U.S. Census Bureau, 2000). However, in 2000, all census tracts in the GSA, the cities of Millbrae, Burlingame, San Bruno, and South San Francisco, had median household incomes above the U.S. Department of Housing and Urban Development, Health and Human Services Poverty Guidelines for a family of four, which is $21,162 (U.S. Census Bureau, 2000).

Table 3.5-4
Income and Housing Information

Municipality	Mean Average Household Income[1]	Total Housing Units[2]	Vacancy Rate[2] (%)
Burlingame	$128,415	13,207	3%
Millbrae	$108,844	8,122	2%
San Bruno	$85,590	14,979	2%
South San Francisco	$90,489	20,127	2%
San Mateo County	$72,102	260,576	2%
Individual Census Tracts Within the GSA			
Census Tract 6023	$81,737	1,118	16%
Census Tract 6042	$78,752	1,129	1%
Census Tract 6041.01	$66,474	2,628	2%
Census Tract 6044	$76,124	1,470	1%
Census Tract 6051	$100,429	1,427	3%

Source: U.S. Census Bureau, 2000 and 2010.

Notes:
[1] 2010 data.
[2] 2000 data.

CT = census tract
GSA = Generalized Study Area

In 2000, census tract 6041.01 had the largest number of housing units (2,628) and census tract 6023 had the smallest number of housing units (1,118). In 2000, census tract 6023 had the highest vacancy rate (16 percent) and census tracts 6044 and 6042 had the smallest vacancy rate (1 percent) (U.S. Census Bureau, 2000).

3.5.5 CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY

SFO is in the vicinity of five school districts: San Bruno Parks Unified School District, Millbrae School District, Burlingame School District, San Mateo Union High School District, and the South San Francisco Unified School District. These five districts have a total of 26 elementary schools, six intermediate/junior high schools, and 10 high schools serving the area. A number of preschools and daycare facilities are also in the area.

No elementary, middle/intermediate, or high schools are within the GSA. Only the Millbrae Nursery School and the Happy Hall School daycare centers are within the GSA. Both daycare centers are west of U.S. 101 and east of El Camino Real.

3.5.6 SURFACE TRANSPORTATION AND TRAFFIC

3.5.6.1 Existing Roadway Network

Roadway access to SFO is served by a network of highways and local streets, as shown on **Figure 3.5-1**. The major regional and local roadways in the vicinity of the GSA, which connect various locations within the adjacent cities of South San Francisco, San Bruno, Millbrae, and Burlingame to the Airport.

U.S. 101/Bayshore Freeway is a principal north-south U.S. highway and major regional transportation corridor that runs along the western shore of the SF Bay, connecting San Francisco to San Jose. U.S. 101 is an eight-lane freeway with auxiliary lanes between the major interchanges. Key freeway interchanges with access to SFO are located at Interstate 380 (I-380), San Bruno Avenue, SFO, and Millbrae Avenue. These interchanges are connected to local streets that include South Airport Boulevard, North McDonnell Road, South McDonnell Road, and Old Bayshore Highway.

North and South McDonnell Road is a four-lane, north-south roadway beginning at the intersection of South Airport Boulevard and San Bruno Avenue and terminating at Millbrae Avenue and Old Bayshore Road. McDonnell Road provides access to the cargo facilities, security checkpoint entrances to the airfield, terminals and parking garages. South Airport Boulevard originates in South San Francisco and connects I-380 to San Bruno Avenue for access to airport parking lots and cargo facilities on the northwestern side of the Airport. San Bruno Avenue is an east-west arterial that originates in San Bruno and connects to the northwestern portion of the Airport. Millbrae Avenue is an east-west arterial originating from Millbrae that provides access to U.S. 101, Old Bayshore Highway, and the southern boundary of the Airport.

3.5.6.2 Existing Transit Service

Rail service to the Airport is provided by Bay Area Rapid Transit (BART), a regional rail service. BART's SFO International Airport Station is in the International Terminal, and serves the East Bay, San Francisco, and northern San Mateo County. The BART station is accessible from any airport terminal via the AirTrain, a fully automated people mover system operated by SFO running between the Airport terminals, terminal parking garages, the Rental Car Center, and the BART/SFO International Airport Station (AirTrain, 2011). BART also provides a connection to Caltrain at the Millbrae Intermodal Station (BART, 2011). Caltrain provides commuter rail service along the San Francisco Peninsula between San Francisco and San Jose. Bus service to the Airport is operated by San Mateo County Transit District (SamTrans), which operates a fixed-route bus service that connects SFO to San Francisco, San Mateo County, and portions of Palo Alto (SamTrans, 2010).

3.6 AIR QUALITY

This section describes existing air quality conditions in the vicinity of SFO and the area of the planned RSA improvements. Information on applicable air quality standards, current attainment/nonattainment

designations, and existing air monitoring data is provided. The air quality impacts associated with the SFO RSA Program improvements are discussed in **Section 4.6**.

The federal Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (U.S. EPA) to establish and periodically review National Ambient Air Quality Standards (national standards or NAAQS) to protect public health and welfare. National standards have been established for the following seven air pollutants, many of which have been enhanced by California-specific standards: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter equal to or less than 10 micrometers (coarse particulates or PM_{10}), particulate matter equal to or less than 2.5 micrometers (fine particulates or $PM_{2.5}$), and lead. The NAAQS are listed in **Table 3.6-1**.

Table 3.6-1
National and California Ambient Air Quality Standards and Bay Area Air Basin Attainment Status for Criteria Pollutants

Pollutant	Averaging Time	Federal Standards (NAAQS)		California Standards (CAAQS)	
		Primary	Bay Area Basin Attainment Status	Concentration	Bay Area Basin Attainment Status
Ozone	1 Hour 8 Hour	– 0.075 ppm	– Marginal Nonattainment[1]	0.09 ppm 0.07 ppm	Nonattainment Nonattainment
Carbon Monoxide	1 Hour 8 Hour	35 ppm 9 ppm	Attainment Attainment	20 ppm 9 ppm	Attainment Attainment
Nitrogen Dioxide	1 Hour AAM	0.100 ppm 0.053 ppm	Unclassified Attainment	0.18 ppm 0.030 ppm	Attainment Attainment
Sulfur Dioxide	1 Hour 3 Hour 24 Hour AAM	0.75 ppm 0.5 ppm 0.14 ppm 0.03 ppm	Attainment Attainment Attainment Attainment	0.25 ppm – 0.04 ppm –	Attainment – Attainment –
Respirable Particulate Matter (PM_{10})	24 Hour AAM	150 μg/m^3 –	Unclassified –	50 μg/m^3 20 μg/m^3	Nonattainment Nonattainment
Fine Particulate Matter ($PM_{2.5}$)	24 Hour AAM	35 μg/m^3 15 μg/m^3	Nonattainment Attainment	– 12 μg/m^3	– Nonattainment
Lead	30 Day Average Quarter	– 0.15 μg/m^3	– Attainment	1.5 μg/m^3 –	Attainment –

Source: BAAQMD, 2011.

Notes:

1 In June 2004, the Bay Area was designated as a marginal nonattainment area of the national 8-hour ozone standard. U.S. EPA lowered the national 8-hour ozone standard from 0.80 to 0.75 ppm (i.e., 75 ppb) effective May 27, 2008. U.S. EPA will issue final designations based upon the new 0.75-ppm ozone standard by July 31, 2011.

AAM = Annual Arithmetic Mean
CAAQS = California Ambient Air Quality Standards
μg/m^3 = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards
PM_{10} = particulate matter equal to less than 10 microns in diameter
$PM_{2.5}$ = particulate matter equal to less than 2.5 microns in diameter
ppm = parts per million

The California Air Resources Board (CARB) manages air quality, regulates mobile emissions sources, and oversees the activities of county and regional air districts within California. CARB also regulates local air quality indirectly by establishing California Ambient Air Quality Standards (state standards or CAAQS)

and vehicle emissions standards, and by conducting research, planning, and coordination activities. As mentioned, California has adopted ambient standards that are more stringent than the federal standards for the criteria air pollutants. The CAAQS are also shown in **Table 3.6-1**.

The Bay Area Air Quality Management District (BAAQMD) has jurisdiction over the Bay Area Air Basin, which encompasses nine counties. BAAQMD is responsible for ensuring that federal and state air quality standards are met by monitoring ambient air pollutant levels throughout the region and implementing strategies to attain the standards. The Association of Bay Area Governments, Metropolitan Transportation Commission, county transportation agencies, cities and counties, and various nongovernmental organizations are also involved in managing air quality in the region.

For the NAAQS, the Bay Area is in attainment/unclassified for CO, NO_2, SO_2, PM_{10}, and lead. In April 1998, the Bay Area was redesignated to attainment for the NAAQS 8-hour CO standard. Thus, it is in a maintenance status.

Under the CAA, the U.S. EPA has classified the Bay Area as marginally nonattainment for the 1997 8-hour ozone standard and required attainment of the standard by 2007. The U.S. EPA has determined that the Bay Area has met this standard, but a formal redesignation request and Maintenance Plan have to be submitted before a formal redesignation can be made. In May 2008, the U.S. EPA lowered the 8-hour ozone standard from 0.080 parts per million (ppm) to 0.075 ppm and, in January 2010, the U.S. EPA again proposed to revise this standard to between 0.060 ppm and 0.070 ppm. The new attainment/nonattainment designation for the Bay Area is expected to be issued within 1 year from final adoption of the revised standards[1].

U.S. EPA lowered the 24-hour $PM_{2.5}$ standard from 65 micrograms per cubic meter ($\mu g/m^3$) to 35 $\mu g/m^3$ in 2006. U.S. EPA designated the Bay Area as nonattainment of the $PM_{2.5}$ standard on October 8, 2009. The effective date of the designation was December 14, 2009 and the BAAQMD has 3 years to develop a plan, called a State Implementation Plan (SIP), that demonstrates the Bay Area will achieve the revised standard by December 14, 2014. The SIP for the new $PM_{2.5}$ standard must be submitted to the U.S. EPA by December 14, 2012.

Under the California Clean Air Act, patterned after the federal CAA, areas have also been designated as attainment or nonattainment with respect to the CAAQS. With respect to these standards, the Bay Area is presently designated as a nonattainment area for ozone, PM_{10}, and $PM_{2.5}$, and attainment/unclassified for CO, NO_2, SO_2, and lead.

3.6.1 SOURCES OF AIR EMISSIONS

The sources of air emissions associated with SFO are typical of sources associated with most large commercial service airports and include aircraft during the landing/takeoff cycle, ground support equipment (GSE), auxiliary power units, airport-related motor vehicles (from passengers, employees, shuttle vans, fleet vehicles, buses, etc.) within the Airport roadway network, construction-related emissions, and stationary sources (e.g., boilers and generators).

[1] As of November 2011, the new designation has not been issued by U.S. EPA.

3.6.2 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

Of growing concern is the impact of proposed projects on climate change. Greenhouse gases (GHGs) trap heat in the earth's atmosphere. Both naturally occurring and anthropogenic (manmade) GHGs include water vapor (H_2O) and carbon dioxide (CO_2). All GHG inventories include measurements of CO_2 emissions, and may include other GHGs, such as methane, nitrous oxide, and O_3. Several classes of halogenated substances that contain fluorine, chlorine, or bromine are also GHGs, but they are, for the most part, solely a product of industrial activities. For example, chlorofluorocarbons and hydrochlorofluorocarbons are halocarbons that contain chlorine, while halocarbons that contain bromine are referred to as bromofluorocarbons (i.e., halons) or sulfur (sulfur hexafluoride).

Research has shown a direct link between fuel combustion and GHG emissions. Therefore, all equipment that requires fuel or power at an airport is a primary source of GHG generation. Aircraft are probably the most often cited source of air pollutants, but they produce the same types of emissions as automobiles. Aircraft jet engines, similar to many other vehicle engines, produce CO_2, H_2O, oxides of nitrogen, CO, oxides of sulfur, unburned or partially combusted hydrocarbons (also known as volatile organic compounds), particulates, and other trace compounds.

According to most international reviews, aviation-related emissions account for a small but potentially important percentage of anthropogenic GHGs and other emissions that contribute to global warming. The Intergovernmental Panel on Climate Change estimates that global aircraft emissions account for about 3.5 percent of the total GHGs produced from human activities, as referenced in U.S. General Accounting Office (GAO) *Environment: Aviation's Effects on the Global Atmosphere Are Potentially Significant and Expected to Grow* (GAO, 2000). In terms of U.S. activities contributing to GHG emissions, the GAO reports that aviation accounts "for about 3 percent of total U.S. GHG emissions from human sources" compared with other industrial sources, including the remainder of the transportation sector (23 percent) and industry (41 percent) (GAO, 2000).

The scientific community is considering areas of further study to enable a more precise estimate of aviation's effects on the global atmosphere. The FAA is currently leading or participating in several efforts to clarify the role that commercial aviation plays in GHG emissions and climate change, including sponsoring the Transportation Research Board Airport Cooperative Research Programs *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories* (ACRP, 2009). Also, a comprehensive multiyear program geared toward quantifying the climate change effects of aviation, the Aviation Climate Change Research Initiative (ACCRI), has been funded by the FAA and the National Aeronautics and Space Administration. The ACCRI is intended to reduce key scientific uncertainties in quantifying aviation-related climate impacts and provide timely scientific input to inform policy decisions. The FAA also funds Project 12 of the Partnership for AiR Transportation Noise & Emissions Reduction Center of Excellence research initiative to quantify the effects of aircraft exhaust and contrails on global and U.S. climate and atmospheric composition.

3.6.3 2010 EXISTING CONDITIONS

The BAAQMD monitors air quality at more than 30 locations throughout the Bay Area. The closest monitoring station to SFO is located at 16th and Arkansas Streets in San Francisco, approximately

10 miles north of the Airport. Criteria pollutants monitored at this location include O_3, CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$; a summary of the monitored pollutants for 2007 through 2009 is provided in **Table 3.6-2**. As can be seen in the table, the data show a trend of generally improving (i.e., lower) concentrations.

Table 3.6-2
Air Quality Data Summary (2007–2009) for the GSA

Pollutant	Monitoring Data by Calendar Year		
	2007	2008	2009
Ozone			
Highest 1 Hour Average (ppm)	0.060	0.082	0.072
Days over State Standard (0.09 ppm)	0	0	0
Highest 8 Hour Average (ppm)	0.053	0.066	0.056
Days over State Standard (0.07 ppm)	0	0	0
Days over Federal Standard (0.075 ppm)	0	0	0
Nitrogen Dioxide			
Highest 1 Hour Average (ppm)	0.069	0.062	0.059
Days over State Standard (0.18 ppm)	0	0	0
Annual Average (ppm)	0.016	0.016	0.015
Exceed State Standard? (0.030 ppm)	No	No	No
Carbon Monoxide			
Highest 1 Hour Average (ppm)	2.5	5.7	4.3
Days over State Standard (20.0 ppm)	0	0	0
Highest 8 Hour Average (ppm)	1.6	2.3	2.9
Days over State Standard (9.0 ppm)	0	0	0
Particulate Matter (PM_{10})			
Highest 24 Hour Average ($\mu g/m^3$)	70	41	36
Days over State Standard (50 $\mu g/m^3$)	2	0	0
Days over Federal Standard (150 $\mu g/m^3$)	0	0	0
Annual Average ($\mu g/m^3$)	21.9	22.0	18.7
Exceed State Standard? (20 $\mu g/m^3$)	No	Yes	No
Particulate Matter ($PM_{2.5}$)			
Highest 24 Hour Average ($\mu g/m^3$)	45.2	29.4	35.6
Days over Federal Standard (35 $\mu g/m^3$)	5	0	1
Annual Average ($\mu g/m^3$)	8.7	9.8	8.4
Exceed State Standard? (12 $\mu g/m^3$)	No	No	No

Source: BAAQMD, 2010.

Notes:
$\mu g/m^3$ = micrograms per cubic meter
PM_{10} = particulate matter equal to less than 10 microns in diameter
$PM_{2.5}$ = particulate matter equal to less than 2.5 microns in diameter
ppm = parts per million

Given that the number of aircraft operations at SFO, and the aircraft fleet mix serving SFO would not change as a result of the Proposed Action Alternative, an operational emissions inventory was not

prepared and is not required under NEPA (in accordance with FAA Order 5050.4B). However, a construction emissions inventory was prepared (see **Section 4.6**).

3.7 WATER RESOURCES

3.7.1 SURFACE AND STORM WATER

San Francisco Bay is the major surface water feature in the vicinity of SFO and forms its eastern border.

Storm water drainage, sanitary wastewater, and industrial wastewater collection are separate systems at SFO. Storm water discharges associated with SFO are regulated by the individual wastewater permit currently issued to the Airport for wastewater associated with the Mel Leong Treatment Plant – Industrial Waste Process (MLTP-IWP) under the National Pollution Discharge Elimination System (NPDES), Permit Number CA0028070, and San Francisco Bay Regional Water Quality Control Board Order Number R2-2007-0060. SFO has developed a Storm Water Pollution Prevention Plan for storm water discharges associated with industrial activities. The main surface drainage features within the boundaries of SFO consist of four storm water detention basins. The drainage system also consists of nine storm water pump stations, ten outfalls to receiving waters, and storm water conveyance pipelines (SFO, 2010a).

Airport-related activities such as aircraft fueling, equipment, and maintenance activities can introduce pollutants into storm water runoff. Pollutants generated within industrial areas of SFO are directed to the industrial wastewater collection system and the MLTP-IWP.

Storm water runoff from the four main drainage areas within SFO is directed to the four constructed detention basins: the West Field Detention Basin (with a capacity of 6 million gallons [MG]): South Detention Basin (1.67 MG); South Oxidation Pond and Bird Ball Ditch, which collect excess runoff; East Detention Basin (0.3 MG); and the North Field Detention Basin (0.425 MG). The South Detention Basin and South Oxidation Pond would be filled as part of the Proposed Action. These basins collect the storm water first flush during a storm event (see **Figure 3.7-1**). Water in the basins is discharged to the industrial wastewater pump stations and pumped to MLTP-IWP for first flush treatment. If the detention basins are at capacity during extended rain events, storm water is discharged to SF Bay in accordance with the Airport's NPDES permit (SFO, 2010a).

The 2010 Integrated Report prepared by the State Water Resources Control Board has assessed water quality in lower San Francisco Bay. The lower SF Bay is listed as an impaired water body for chlordane, dichlorodiphenyltrichloroethane, dieldrin, dioxin compounds, furan compounds, invasive species, mercury, polychlorinated biphenyls, and trash (SWRCB, 2010).

SFO is in the South Bay Basin, a hydrologic planning area delineated in the San Francisco Bay Basin Water Quality Control Plan (Basin Plan [RWQCB, 2010]). The existing beneficial uses for the lower SF Bay in the South Bay Basin have been identified as industrial service supply; ocean, commercial, and sport fishing; shellfish harvesting; estuarine habitat; fish migration; preservation of rare and endangered species, wildlife habitat; contact and noncontact water recreation (REC-1 and REC-2); and navigation. Additionally, fish spawning has been identified as a potential beneficial use of the lower SF Bay in the South Bay Basin (RWQCB, 2010).

3.7.2 GROUNDWATER

SFO is in the Westside Groundwater Basin. The Westside Groundwater Basin borders the northeastern part of Golden Gate Park in the north, the San Bruno Mountains in the east, the SF Bay in the south, and the San Andreas Fault and Pacific Ocean in the west. The aquifer is unconfined at depths less than 100 feet, and confined at depths greater than 100 feet (DWR, 2006).

The depth to groundwater at SFO may vary by a few feet depending on seasonal precipitation and tidal fluctuation. Geotechnical studies have collected boring data indicating that the depth to groundwater ranges from 0 to 17 feet, with most borings showing depth to groundwater between 3 and 10 feet below ground surface (SFO, 2006).

According to the Basin Plan, the Westside Groundwater Basin has the following existing beneficial uses in the vicinity of SFO: municipal and domestic water supply, industrial process water supply, industrial service water supply, and the potential beneficial use of agricultural water supply (RWQCB, 2010).

3.7.3 WATER SUPPLY

Drinking water at SFO is supplied by the San Francisco Public Utilities Commission (SFPUC) and is distributed within the Airport through the SFO transmission system. The transmission system consists predominantly of steel and ductile iron pipes ranging in size from 4 to 24 inches and does not include pump stations or storage tanks for potable water (HNTB, 2002).

3.7.4 SANITARY WASTEWATER AND TREATMENT

SFO's sanitary wastewater from the Airport terminal complex, warehouses, hangars, and office complexes is collected in the Airport sanitary sewer system via an 18-inch force main pipeline (HNTB, 2002). The sanitary sewer system conveys the wastewater to the Airport's Mel Leong Treatment Plant – Sanitary Sewage Process for treatment (SFO, 2010a).

3.8 FISH, WILDLIFE AND PLANTS

3.8.1 VEGETATION COMMUNITIES AND COVER TYPES

Vegetation communities within the APE include annual grassland, seasonal wetland, freshwater/brackish marsh, and tidal marsh. Cover types include developed, tidal mudflats, and open water. Each of these communities and cover types is briefly discussed below. Additional details are provided in the Biological Assessment (BA) for the project, attached to this document as **Appendix E1**.

Annual Grassland. Annual grassland is the dominant community in the Airport infield areas between the airfield runways and taxiways. The density of vegetation cover is dependent on a variety of factors (e.g., elevation, soil compaction, soil salinity, etc.) and ranges from mostly barren areas with no plant cover to sparsely vegetated areas with widely scattered plants to more densely vegetated areas nearing 100 percent vegetative cover. These areas are mowed regularly and occasionally sprayed with herbicides to control plant growth for safety reasons (required under 14 CFR Part 139 – Wildlife Hazard Management).

Source
Aerial Photo and Drainage Information, SFO, 2009-2010

DRAINAGE AREAS AND STORM WATER OUTFALLS

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 3.7-1

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Seasonal Wetland. Several seasonal wetlands with species composition similar to adjacent grasslands are also scattered throughout the Airport infields and consist of topographic depressions that pond water during the rainy season. In addition to supporting the species identified above, some depressions support brass buttons (*Cotula coronopifolia*), curly dock (*Rumex crispus*), and pickleweed (*Salicornia virginica*).

Freshwater/Brackish Marsh. A small amount of freshwater/brackish marsh vegetation occurs around the margins of two artificially constructed drainage features southeast of Runway 1R referred to as South Oxidation Pond and Bird Ball Ditch (also see Section 3.7 for discussion of storm water drainage system). South Oxidation Pond is an earthen sediment basin that was constructed in 1966 to collect surface runoff from the southern portion of the airfield and is one component of the overall storm water drainage system in the South Airfield Area. Bird Ball Ditch, named after the layer of plastic floating balls placed over the water surface to discourage bird use, is a 40-foot-wide storm water channel north of South Oxidation Pond that was also constructed to collect runoff from the southern portion of the airfield.

Tidal Marsh. Tidal marsh is limited to a relatively narrow band (the average width is approximately 50 to 100 feet) southeast of Runway 1R. The marsh is comprised of several elevational zones that vary in plant species composition due to differences in tidal inundation and associated variations in salinity. Lower marsh elevations adjacent to tidal mudflat and open water support dense stands of both native cordgrass (*Spartina foliosa*) and nonnative invasive smooth cordgrass (*Spartina alterniflora*). Middle elevations are dominated by pickleweed, which intermixes with increasing amounts of alkali heath (*Frankenia salina*) and saltgrass as the marsh transitions into the adjacent upland zone, which is dominated by dense patches of nonnative ruderal species, such as Italian thistle (*Carduus pycnocephalus*), iceplant (*Carpobrotus edulis*), and bristly ox-tongue (*Picris echioides*), as well as annual grasses.

Developed. Developed portions of the Airport in the APE consist of the existing pavements such as runways, taxiways, service/maintenance roads, buildings, and other structures/facilities. Vegetation associated with these areas is limited to sparse ornamental plantings of native and nonnative trees and shrubs adjacent to some of the buildings.

Tidal Mudflats. The tidal mudflats near SFO are comprised of silt, clay, and fine sand, and include organic debris and shell fragments. They also support a diverse community of benthic invertebrates such as clams, worms, and crabs, which are a valuable food source for many species of shorebirds. This cover type is most prevalent in the Burlingame tidal flats southeast of SFO.

Open Water. Open water refers to open SF Bay waters within the APE below mean lower low water. The trestle structures in the SF Bay that support the approach light systems are situated at the approach ends of Runways 28L, 28R, and 19L in shallow water.

3.8.2 WILDLIFE

Fish. Common marine fish known to occur in the SF Bay waters adjacent to SFO include English sole (*Parophrys vetulus*), Bay goby (*Lepidogobius lepidus*), northern anchovy (*Engraulis mordax*), speckled sanddab (*Citharichthys stigmaeus*), topsmelt (*Atherinops affinis*), arrow goby (*Clevelandia ios*), staghorn

sculpin (*Leptocottus armatus*), striped surfperch (*Embiotoca lateralis*), and yellowfin goby (*Acanthogobius flavimanus*) (URS, 2001).

Amphibians and Reptiles. Amphibian and reptile use of the APE is expected to be minimal due to lack of suitable habitat, although concrete rubble piles, riprap, and other hard surfaces may support small numbers of western fence lizard (*Sceloporus occidentalis*) and southern alligator lizard (*Elgaria multicarinatus*). Amphibian or reptile use of tidal marshes and mudflats is limited due to high salinity and risk of drowning.

Birds. The majority of wildlife expected to use the terrestrial portions of the APE are bird species adapted to developed areas, such as American crow (*Corvus brachyrhynchos*), rock pigeon (*Columba livia*) and house finch (*Carpodacus mexicana*). The infields between the airfield runways provide habitat for bird species that forage in open grasslands such as western meadowlark (*Sturnella neglecta*). Raptor species, such as red-tailed hawk (*Buteo jamaicensis*) and American kestrel (*Falco sparverius*), forage over the infields for small mammals.

The tidal marsh supports a variety of species that are specially adapted to the salt-tolerant vegetation, microhabitats (e.g., channels and sloughs), and tidal regimes that characterize such areas. Many of these species receive special regulatory protection from both federal and state natural resource agencies due to their habitat specificity and limited distribution around the SF Bay (e.g., California clapper rail).

The open SF Bay waters adjacent to SFO provide habitat for a wide variety of waterbirds (i.e., ducks, shorebirds, and waders) throughout the year, with the largest concentrations in the winter. Diving ducks, such as greater scaup (*Aythya marila*), surf scoter (*Melanitta perspicillata*), and bufflehead (*Bucephala albeola*), are the primary species occurring in the vicinity of SFO. The Burlingame tidal mudflats southeast of the airfield provide valuable foraging habitat for shorebird species, such as willet (*Tringa semipalmata*), marbled godwit (*Limosa fedoa*), and western sandpiper (*Calidris mauri*) among others (URS, 2001). Other bird species that spend the majority of their time roosting in or foraging over open water include various grebes, double-crested cormorant (*Phalacrocorax auritus*), western gull (*Larus occidentalis*), and Forster's tern (*Sterna fosteri*). Wading birds (i.e., herons and egrets) forage in the airfield's seasonal wetlands, as well as along the shoreline and in the tidal marsh.

Mammals. The most common mammal species expected to occur within the APE are urban-adapted generalist species, such as northern raccoon (*Procyon lotor*) and striped skunk (*Mephitis mephitis*). The grassed Airport infields support small populations of burrowing rodents, such as California vole (*Microtus californicus*) and Botta's pocket gopher (*Thomomys bottae*). Harbor seal (*Phoca vitulina*) and California sea lion (*Zalophus californianus*) are the primary marine mammal species associated with SF Bay and both may occasionally forage close to the shoreline and around the pilings.

3.8.3 PROTECTED SPECIES

In addition to species protected under the federal Endangered Species Act (ESA), this section considers the potential for State-listed species protected under the California ESA to occur within the APE. To identify federal- and state-listed species potentially occurring in the APE, an official species list was obtained from the Sacramento Fish and Wildlife Office of the U.S. Fish and Wildlife Service, and a query

was conducted of the California Natural Diversity Database (CDFG, 2010) for the Montara Mountain, San Mateo, Hunters Point, and San Francisco South U.S. Geological Survey 7.5-minute quadrangles. Oceanic species known to occur along the west coast of the San Francisco Peninsula in salt water of the Pacific Ocean (e.g., black abalone, southern sea otter, whales, sea turtles) but not in SF Bay were not included in the list or evaluated. From these sources, a list of 38 federally and/or State-listed species potentially occurring in the GSA was compiled (**Table 3.8-1**). Based on a review of the distribution and habitat requirements of these species and the habitat available in the APE, 31 of these species are not likely to occur. Further analysis of the seven remaining species based on the presence of suitable habitat and/or their known occurrence near SFO is described in **Sections 3.8.3.1** and **3.8.3.2**. Each of these species is briefly discussed below, with federal- listed species discussed first, followed by state-listed species. Additional details on each species is provided in the project BA (see **Appendix E1**).

The FAA completed ESA Section 7 consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. The details of the consultation effort are described in Section 4.8.

3.8.3.1 Federal-Listed Species

Green Sturgeon

The southern distinct population segment (DPS) of green sturgeon (*Acipenser medirostris*) was federally listed as threatened on April 7, 2006 (71 Federal Register [FR] 17757). Critical habitat for the southern DPS of green sturgeon was designated by the National Marine Fisheries Service on October 9, 2009 (74 FR 52300) and took effect on November 9, 2009. This designation includes all waters of SF Bay.

Green sturgeon is uncommon in the San Francisco Estuary, although records exist for the Central and South San Francisco Bay (Leidy, 2007). This species is only expected to occur in the SF Bay waters adjacent to SFO on an occasional basis. Stray individuals may occasionally venture near SFO from their primary migration route from the Golden Gate north to the Sacramento-San Joaquin Delta (an approximate distance of 25 miles), but such movements are expected to be rare and short-term in duration.

Chinook Salmon (Sacramento River Winter-run Evolutionarily Significant Unit)

The Sacramento River winter-run evolutionarily significant unit (ESU) of Chinook salmon (*Oncorhynchus tshawytscha*) was federally listed as endangered on January 4, 1994 (59 FR 440); endangered status was reaffirmed on June 28, 2005 (70 FR 37160). Critical habitat for this ESU was designated on June 16, 1993, although, the waters within and adjacent to the APE are not part of any Chinook salmon critical habitat (i.e., hydrologic) units.

This species is only expected to occur in the SF Bay waters adjacent to the APE on an occasional basis, if at all. Individuals may occasionally stray near SFO from their primary migration route from the Golden Gate north to the Sacramento-San Joaquin Delta (an approximate distance of 25 miles), but such movements are expected to be rare and short-term in duration.

Table 3.8-1
Federal and State-Listed Species
that Have the Potential to Occur in the Project Vicinity
San Francisco International Airport

Common Name	Scientific Name	Federal	State	Potential for Occurrence
Plants				
San Mateo thorn-mint	*Acanthomintha duttonii*	LE	SE	Not expected to occur. Serpentine soils not present.
San Bruno Mountain manzanita	*Arctostaphylos imbricata*	–	SE	Not expected to occur. Species only known to occur on San Bruno Mountain.
Presidio manzanita	*Arctostaphylos montana* ssp. *ravenii*	LE	SE	Not expected to occur. Rocky, serpentine slopes not present.
Pacific manzanita	*Arctostaphylos pacifica*	–	SE	Not expected to occur. Coastal scrub or chaparral not present.
Robust spineflower	*Chorizanthe robusta* var. *robusta*	LE	–	Not expected to occur. Sandy soils not present.
Crystal Springs fountain thistle	*Cirsium fontinale* var. *fontinale*	LE	SE	Not expected to occur. Riparian or serpentine chaparral not present; project vicinity too low in elevation (only occurs from 300 to 600 feet).
San Mateo woolly sunflower	*Eriophyllum latilobum*	LE	SE	Not expected to occur. Known from only two occurrences in San Mateo County (CNPS, 2010). Serpentine soils in oak woodland not present.
Marin dwarf (=western) flax	*Hesperolinon congestum*	LT	ST	Not expected to occur. Serpentine soils not present.
Beach layia	*Layia carnosa*	LE	SE	Not expected to occur. Coastal sand dunes not present.
San Francisco lessingia	*Lessingia germanorum*	LE	SE	Not expected to occur. Species limited to six sites in Presidio of San Francisco and one site in Daly City (CNPS, 2010).
White-rayed pentachaeta	*Pentachaeta bellidiflora*	LE	SE	Not expected to occur. Rocky, serpentine slopes not present.
Hickman's potentilla (=cinquefoil)	*Potentilla hickmanii*	LE	SE	Not expected to occur. Coastal bluff scrub and coniferous forest not present. Seasonal wetlands on airfield too disturbed.
Adobe sanicle	*Sanicula maritima*	–	SR	Not expected to occur. Moist clay or ultramafic soils not present.
California seablite	*Suaeda californica*	LE	–	Not expected to occur. Last recorded in SFO vicinity (Bay Farm Island) in 1943. Only known to occur in Morro Bay and Cayucos Point in San Luis Obispo County (CNPS, 2010). Not found during focused surveys of marsh at Bayfront Park in 2000 (URS, 2001).
Invertebrates				
San Bruno elfin butterfly	*Callophrys mossii bayensis*	LE	–	Not expected to occur. Coastal scrub with larval host plant (*Sedum spathulifolium*) not present.
Bay checkerspot butterfly	*Euphydryas editha bayensis*	LE	–	Not expected to occur. Native grasslands with serpentine soils not present.
Mission blue butterfly	*Icarica icarioides missionensis*	LE	–	Not expected to occur. Coastal grassland and chaparral between 690 and 1,180 feet in elevation not present.

Table 3.8-1
Federal and State-Listed Species
that Have the Potential to Occur in the Project Vicinity
San Francisco International Airport (Continued)

Common Name	Scientific Name	Federal	State	Potential for Occurrence
Callippe silverspot butterfly	*Speyeria callippe callippe*	LE	–	Not expected to occur. Suitable grassland habitat not present. Species only known from San Bruno Mountain and Sign Hill in San Mateo County, hills near Pleasanton in Alameda County, Sears Point in Sonoma County, and hills between Vallejo and Cordelia in Solano County.
Myrtle's silverspot butterfly	*Speyeria zerene myrtleae*	LE	–	Not expected to occur. Considered extirpated from San Mateo County (CDFG, 2010).
Fish				
Green sturgeon (southern DPS)	*Acipenser medirostris*	LE, CH	–	Low potential. Individuals may occasionally be present in San Francisco Bay waters within project vicinity.
Tidewater goby	*Eucyclogobius newberryi*	LE	–	Not expected to occur. Species considered extinct from San Francisco Bay (Moyle, 2002).
Longfin smelt	*Spirinchus thaleichthys*	–	ST	May occur. Species likely occurs intermittently in San Francisco Bay waters within project vicinity.
Delta smelt	*Hypomesus transpacificus*	LT	SE	Not expected to occur. Species not known to occur in south San Francisco Bay.
Chinook salmon (Sacramento River winter-run ESU)	*Oncorhynchus tshawytscha*	LE, CH	SE	Low potential. Individuals may occasionally be present in San Francisco Bay waters within project vicinity.
Chinook salmon (Central Valley spring-run ESU)	*Oncorhynchus tshawytscha*	LT	ST	Low potential. Individuals may occasionally be present in San Francisco Bay waters within project vicinity.
Steelhead (central California coast ESU)	*Oncorhynchus mykiss*	LT		May occur. Species likely occurs intermittently in San Francisco Bay waters within project vicinity.
Steelhead (Central Valley ESU)	*Oncorhynchus mykiss*	LT		Not expected to occur. Project vicinity outside known range of this ESU.
Coho salmon (central California coast ESU)	*Oncorhynchus kisutch*	LE	SE	Not expected to occur. Species not recorded in San Francisco Estuary since early to mid-1980s (Leidy, 2007).
Amphibians and Reptiles				
California tiger salamander	*Ambystoma californiense*	LT	ST	Not expected to occur. No known occurrences in SFO vicinity. Ongoing maintenance and fill substrate precludes occurrence within seasonal wetlands on airfield.
California red-legged frog	*Rana draytonii*	LT		Not expected to occur. Known to occur on West-of-Bayshore property west of U.S. 101 but has never been observed nor is expected to occur east of U.S. 101 due to significant physical barriers to dispersal and lack of suitable aquatic/upland habitat.
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	LE	SE	Not expected to occur. Known to occur on West-of-Bayshore property west of U.S. 101 but has never been observed nor is expected to occur east of U.S. 101 due to significant physical barriers to dispersal and lack of suitable aquatic/upland habitat.

Table 3.8-1
Federal and State-Listed Species
that Have the Potential to Occur in the Project Vicinity
San Francisco International Airport (Continued)

Common Name	Scientific Name	Federal	State	Potential for Occurrence
Birds				
California black rail	*Laterallus jamaicensis coturniculus*		ST, CFP	Not expected to occur. Tidal marsh along southeastern edge of airfield too narrow for adequate high marsh and transitional marsh vegetative cover for high-tide refugia. Species very rare and not known to breed in South Bay.
California clapper rail	*Rallus longirostris*	LE	SE, CFP	Known to occur. Four individuals heard calling in tidal marsh along southeastern edge of airfield on October 12, 2010 (field observation). Field surveys conducted for San Francisco Estuary Invasive Spartina Project detected individuals in tidal marsh south of Runway 1R in 2007, 2008, and 2009.
Western snowy plover	*Charadrius alexandrinus nivosus*	LT		Not expected to occur. Suitable sandy beach, alkali flat, or salt pond habitat not present. No known nest colonies in project vicinity.
Bank swallow	*Riparia riparia*		ST	Not expected to occur. Vertical banks or cliffs with fine-textured soils not present.
California least tern	*Sterna antillarum browni*	LE	SE, CFP	Very low potential. Migrating individuals may rarely forage over San Francisco Bay waters adjacent to airfield, but regular airfield disturbance precludes nesting. No known nest colonies in project vicinity.
Marbled murrelet	*Brachyramphus marmoratus*	LT	SE	Not expected to occur. Old-growth coniferous forest not present.
Mammal				
Salt marsh harvest mouse	*Reithrodontomys raviventris*	LE	SE, CFP	Not expected to occur. No known records in SFO vicinity. Tidal marsh along southeastern edge of airfield is marginal due to small size/linear configuration, lack of suitable high-tide refugia, proximity to disturbance and predators, and isolation from known populations to the south.

Sources: USFWS, 2010a, CDFG, 2010.

Notes:

CFP	California Fully Protected Species
CH	Critical habitat designated by USFWS
DPS	distinct population segment
ESU	evolutionary significant unit
LE	Federally listed, endangered
LT	Federally listed, threatened
SE	State listed, endangered
SFO	San Francisco International Airport
SR	State listed, rare
ST	State listed, threatened
U.S. 101	U.S. Highway 101

Chinook Salmon (Central Valley Spring-run Evolutionarily Significant Unit)

The Central Valley spring-run ESU of Chinook salmon was federally listed as threatened on September 16, 1999 (64 FR 50393); threatened status was reaffirmed on June 28, 2005 (70 FR 37160). Critical habitat for this ESU was designated on September 2, 2005, with an effective date of January 2, 2006. The APE is not within any critical habitat units for this species.

This species is only expected to occur in the SF Bay waters adjacent to the APE on an occasional basis, if at all. Individuals may occasionally stray near SFO from their primary migration route from the Golden Gate north to the Sacramento-San Joaquin Delta (an approximate distance of 25 miles), but such movements are expected to be rare and short-term in duration.

Steelhead (Central California Coast Distinct Population Segment)

The central California coast DPS of steelhead was federally listed as threatened on August 18, 1997 (62 FR 43937); threatened status was reaffirmed on January 5, 2006 (71 FR 834). Critical habitat for this ESU was designated on September 2, 2005, with an effective date of January 2, 2006. This designation includes the SF Bay waters within and adjacent to the APE.

Although no streams in the immediate APE (e.g., Colma Creek) are known to support anadromous steelhead, several known populations occur in streams farther south (e.g., San Mateo Creek, San Francisquito Creek, Guadalupe River) (Leidy et al., 2005). Small numbers of steelhead migrating to and from these streams may occasionally venture into the waters within and adjacent to the APE, although such occurrences would likely be intermittent.

California Clapper Rail

The federal- and state-endangered California clapper rail is a year-round resident of tidal salt marshes of the San Francisco Estuary. California clapper rails occur primarily in emergent salt and brackish marshes with extensive stands of cordgrass and pickleweed, abundant dense vegetation at higher elevations for nesting and high-tide refugia, and a network of tidal channels that provide foraging habitat.

California clapper rails have recently been reported to occur in the tidal marsh along the southeastern edge of the airfield based on field surveys by the San Francisco Estuary Invasive Spartina Project (Spautz, 2007; McBroom, 2008, 2009). In addition, LSA Associates heard four clapper rails calling in the same marsh during an October 12, 2010 reconnaissance site visit, including two in a large stand of nonnative cordgrass approximately 300 feet southeast of the existing storm drain outfall pipes. The upper marsh provides marginal habitat quality for clapper rails due to its narrow, linear configuration and limited extent of dense vegetation for nesting and high-tide cover, but the presence of calling individuals during the breeding season (Spautz, 2007; McBroom, 2008, 2009) indicates that at least a few individuals may attempt to breed here.

Salt Marsh Harvest Mouse

The federal- and state-endangered salt marsh harvest mouse is endemic to the tidal salt marshes and adjacent diked wetlands of the San Francisco Estuary. Salt marsh harvest mice are dependent on a

dense cover of native halophytes (salt-tolerant plants) and are typically associated with mid- to upper-marsh vegetation dominated by pickleweed and associated saline emergent vegetation (Shellhammer, 1977). "Strip" marshes with narrow middle and high marsh zones support few to no mice due to the more frequent and intense flooding associated with such marshes (USFWS, 2009). Most marshes of South San Francisco Bay are strip-like marshes and, as such, support few mice (USFWS, 2009).

Salt marsh harvest mice are not expected to occur in the APE due to the marginal habitat quality of the existing tidal marsh (i.e., limited extent of pickleweed-dominated middle marsh and lack of dense cover in upper marsh and adjacent upland), isolation of the marsh from known populations farther to the south, abundance of terrestrial and avian predators, and the absence of adequate undisturbed/unmaintained uplands and upper marsh transition habitat adjacent to the tidal marsh that provides refugia during high tide events.

3.8.3.2 State-Listed Species

In addition to being protected under the federal ESA, the following species discussed above are also protected under the California ESA: Chinook salmon (Sacramento River winter-run ESU; state endangered), Chinook salmon (Central Valley spring-run ESU; State threatened), California clapper rail (state endangered), and salt marsh harvest mouse (state endangered). California clapper rail and salt marsh harvest mouse are also listed as Fully Protected under the California Fish and Game Code, and may not be taken or possessed at any time. The California Department of Fish and Game does not issue licenses or permits for take of these species except for necessary scientific research. Longfin smelt is the only species potentially occurring in the APE that is state- but not federal-listed, and is briefly discussed below.

Longfin Smelt

Longfin smelt was state-listed as threatened on April 10, 2010. Adult and juvenile longfin smelt can be found in the open waters of estuaries, mostly in the middle or at the bottom of the water column. In the San Francisco Estuary, the center of their distribution gradually moves southward in the estuary during summer. They concentrate in most years in San Pablo Bay in April to June and become more dispersed in late summer. The population gradually shifts upstream in late fall and winter, as yearlings begin to move upstream to spawn. Spawning takes place in freshwater, over sandy or gravel substrates, rocks, and aquatic plants. In the San Francisco Estuary, spawning occurs mainly downstream of Medford Island in the San Joaquin River.

Longfin smelt range widely within southern, central, and northern SF Bay (Moyle, 2002) and individuals of this species could be present in the SF Bay waters within the APE at any time.

3.8.3.3 Essential Fish Habitat

The SF Bay waters within and adjacent to the APE are considered essential fish habitat for a variety of fish species covered under the Pacific Groundfish Fishery Management Plan (FMP), Coastal Pelagic Species FMP and Pacific Salmon FMP, including the following species known to occur in SF Bay waters adjacent to SFO. These species include the northern anchovy, English sole, leopard shark, spiny

dogfish, big skate, starry flounder, sand sole, curlfin sole, and Chinook salmon. Groundfish species occur in various marine habitat types from intertidal areas to the depths of the continental slope, on sand or mud bottoms, in rocky reef areas, or in the water column. Federally managed groundfish occurring in the South Bay include more than 90 species of rockfish, flatfish, roundfish, as well as sharks and skates. Pelagic species occur in the water column as opposed to living near the floor of the open ocean or estuaries. Representative species in the South Bay include Pacific sardine, Northern anchovy, and market squid. Anadromous salmonids, such as Chinook and coho salmon, are managed under the Pacific Salmon FMP. These species use freshwater streams and rivers for spawning. Young salmon then migrate to the ocean for feeding and growth, and return to their natal waters to spawn. Nearshore and inshore environments, such as those adjacent to SFO, are regions of physical and chemical variability due to the influx of freshwater from rivers and runoff from both urbanized and non-urbanized watershed lands (PFMC, 2006).

3.9 WETLANDS

Waters within Clean Water Act jurisdiction, also known as Waters of the United States, fall into two categories: wetlands and other waters. The extent of Waters of the United States are defined in 33 CFR Part 328. Wetlands include marshes, meadows, seep areas, floodplains, basins, and other areas experiencing inundation or saturation at a frequency to support a prevalence of vegetation typically adapted for saturated soil conditions. Seasonally or intermittently inundated features, such as seasonal pools, ephemeral streams and tidal marshes, are categorized as wetlands if they have hydric soils and support wetland plant communities. Other waters include waterbodies and watercourses such as rivers, streams, lakes, springs, ponds, coastal waters, and estuaries. Seasonally inundated waterbodies or watercourses that do not exhibit wetland characteristics are classified as other waters of the United States.

A formal request for verification of the jurisdictional boundaries applicable to the SFO RSA Program was submitted to the U.S. Army Corps of Engineers (USACE) on December 8, 2010. An updated request letter with accompanying figures was submitted to the USACE on May 19, 2011 and was verified by USACE on August 3, 2011 (USACE File #11-00273).

3.9.1 WETLANDS AND OTHER WATERS

Jurisdictional wetlands within the APE includes 2.41 acres of seasonal wetland in South Oxidation Pond (see **Figure 3.9-1**) and 0.54 acre of seasonal wetland adjacent to the east end of Runway 28R (see **Figure 3.9-2**). As described above in **Section 3.8.1**, South Oxidation Pond is an earthen-bottomed sediment basin that was constructed in 1966 to collect surface runoff from the southern portion of the Airport (see the photograph in the BA, provided in **Appendix E1**). The bottom of the basin supports hydrophytic vegetation characteristic of seasonal wetlands, such as saltgrass, prickle grass, velvet grass, brass buttons, and curly dock. A small band of alkali bulrush and cattails is also present around the margin of the basin bottom. The steep slopes of the basin are dominated by a dense growth of ruderal herbaceous species, including wild radish and bristly ox-tongue. While this basin was in active use in 1996 and supported primarily open-water conditions (i.e., other waters of the United States), the pond now supports mostly seasonal wetland habitat due to lower inputs of stormwater runoff. The jurisdictional

status of this feature was verified by the USACE in 2002 and on August 3, 2011 (USACE File #11-00273).

A 0.04-acre tidal marsh is present below the 5.0-foot elevation contour along the southern edge of the airfield (i.e., southeast of Runway 1R-19L) (see **Figure 3.9-1**). Vegetative characteristics of the marsh are described above in **Section 3.8.1**. The boundary of the tidal marsh was verified by the USACE on January 11, 2000 (USACE File #22218S) and on August 3, 2011 (USACE File #11-00273).

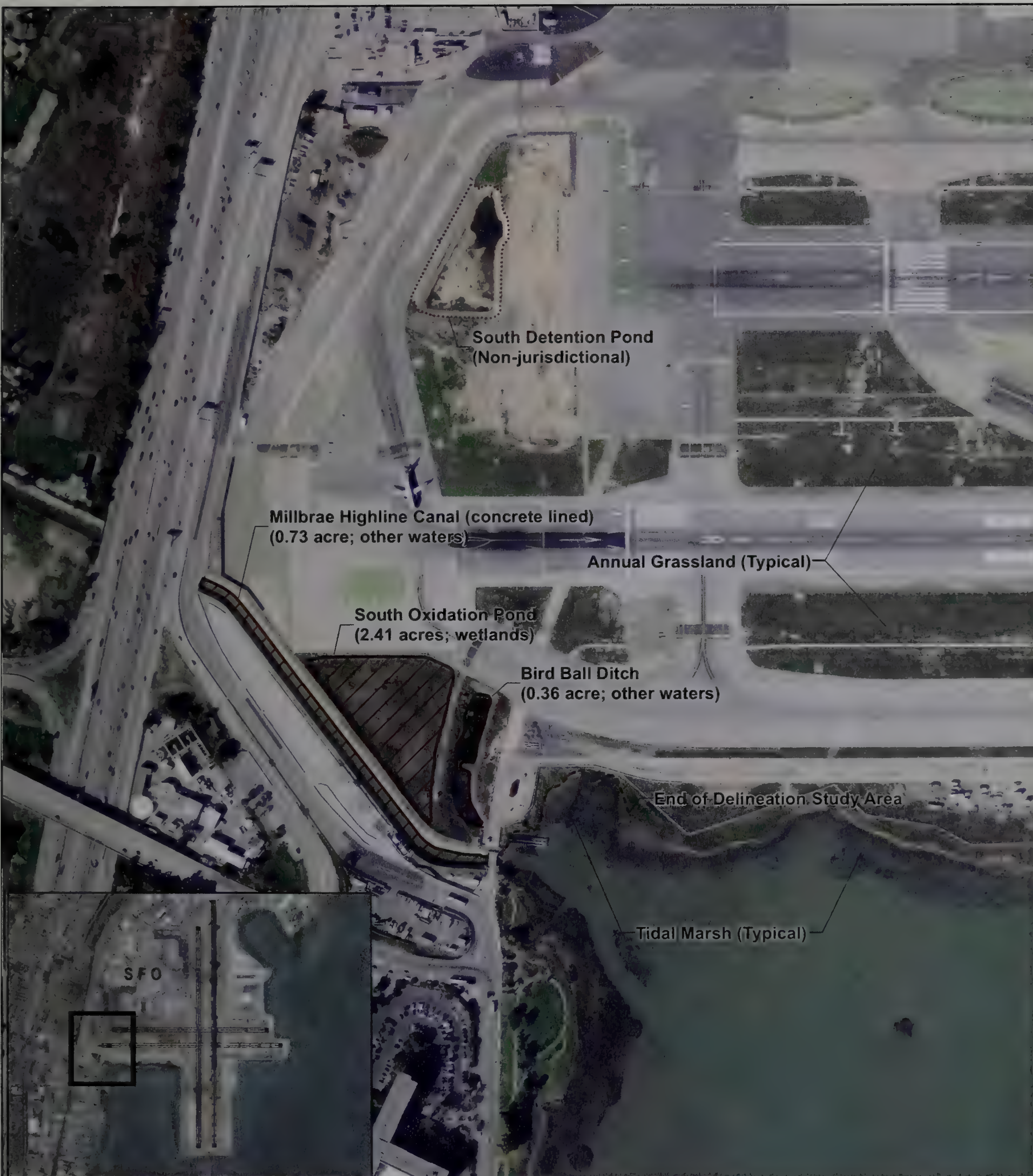
Bird Ball Ditch, classified as other waters of the United States, occupies 0.36 acre on the Airport. It is about 40 feet wide at the top and is located southeast of the approach end of Runway 1R (see **Figure 3.9-1**). Bird Ball Ditch was constructed to collect stormwater runoff from the southern portion of the Airport and has a small band of alkali bulrush and cattails around its perimeter (see the photograph provided the BA in **Appendix E1**). The channel is segmented into two ponds. Plastic floating balls have been placed to completely cover the surface of the downstream pond to discourage bird use (hence the name "Bird Ball Ditch"). This feature was verified by the USACE in 2002, 1996, and on August 3, 2011 (USACE File #11-00273).

The Millbrae Highline Canal is a concrete-lined stormwater channel to the south of South Oxidation Pond (see **Figure 3.9-1**). The canal carries runoff from South Lomita Canal on the West-of-Bayshore property and other watershed lands within the City of Millbrae to the west and transports flows through tide gates to the SF Bay. The canal supports no vegetation and is 45 feet wide at the top of the concrete slopes. The width of the canal at the waterline is 25 feet; the total jurisdictional area of the canal within the project area equals 0.73 acre (other waters of the United States). This feature was included in the May 19, 2011 submittal as a jurisdictional feature and was verified by USACE on August 3, 2011 (USACE File #11-00273).

A 0.54-acre seasonal wetland/ponding area is also present in the project area between an airfield access road and the approach (east) end of Runway 28R (see **Figure 3.9-2**). The edge of the depression is within 50 feet of an active runway and therefore has been subject to significant attention by SFO for the management of bird strike hazards. This feature was previously considered isolated and therefore was determined to be a non-jurisdictional feature by the USACE in 2002. This feature was included in the May 19, 2011 submittal as a jurisdictional feature and was verified by USACE on August 3, 2011 (USACE File #11-00273).

3.10 FLOODPLAINS

SFO is depicted on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map Community Panel Numbers 0603110019B, 0603110107B, 0603110126B, and 0650450002B (effective date July 5, 1984; FEMA, 1984a; 1984b; 1984c; 1981). As shown on **Figure 3.10-1,** approximately half of the Airport is in Zone C, which is designated as an area of minimal flooding. A small area in the southern part of the Airport is designated as Zone B, which is defined by FEMA as an area of moderate flood hazard that may experience shallow flooding or is protected by levees. Zone B is between the limits of the 100-year and



LEGEND

- Jurisdictional Area
- Non-jurisdictional Feature
- Tidal Marsh Jurisdictional Boundary

N

0 200 400 FEET

Source:
Aerial Photo, USGS, 2009.

JURISDICTIONAL AREAS IN THE VICINITY OF RUNWAYS 1L AND 1R

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 3.9-1

LEGEND

- ● Wetland Sample Point
- O Non-wetland Sample Point
- - - - High Tide Line

Source:
Aerial Photo, USGS, 2009.

N

0 200 400
FEET

JURISDICTIONAL AREAS IN THE VICINITY OF RUNWAYS 28L AND 28R

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 3.9-2

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LEGEND

- Zone A; Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
- Zone B; Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.
- Zone C; Areas of minimal flooding.
- Zone V-1; Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

Source
FEMA 1984a, 1984b, 1984c, 1981

Note: Flood zones beyond SFO are not shown

100-YEAR FLOODPLAIN

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 3.10-1

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500-year flood. The remainder of SFO property is designated as Zone A, which are areas subject to the 100-year flood for which base flood elevations and flood hazard factors have not been determined. Additionally, the waters of the SF Bay directly to the east of SFO are designated Zone V1, defined as areas of 100-year coastal flood with velocity (wave action) with a base flood elevation of 7 feet.

SFO is in the process of updating the Flood Insurance Rate Map with FEMA to reflect the sea wall around the perimeter of the Airport.

3.11 COASTAL RESOURCES

The San Francisco Bay Conservation and Development Commission (BCDC) is the agency responsible for administering the provisions of the Federal Coastal Zone Management Act of 1972 under the State of California's approved coastal zone management program. BCDC's coastal management program is based on the provisions and policies of the McAteer-Petris Act, the Suisun Marsh Preservation Act of 1977, the San Francisco Bay Plan (Bay Plan [BCDC, 2008]), the Suisun Marsh Protection Plan, and the BCDC's administrative regulations.

BCDC's jurisdiction extends over all tidal areas of SF Bay and a shoreline band, which extends 100 feet inland from the mean high tide line. Within this area, BCDC has permitting responsibility for all SF Bay filling, dredging, or substantial change in use of land, water, or structures. At SFO, BCDC's jurisdiction includes portions of the Airport property that are within the shoreline band as well as areas within SF Bay where Airport-related facilities are installed, such as the approach lighting systems for Runways 19L, 28L, and 28R that are mounted on wooden trestles. The length of SF Bay shoreline within SFO's property boundary is approximately 7 miles.

The BCDC's Bay Plan was originally adopted in 1969 and has been periodically updated to guide future uses of SF Bay and the shoreline (BCDC, 2008). The Bay Plan includes policies that address SF Bay resources, uses of the shoreline, and filling of the Bay, as well as maps that apply the plan policies to present uses of the Bay shoreline. BCDC requires consistency with Bay Plan policies for the issuance of BCDC permits for filling, dredging, and shoreline development.

3.12 HISTORIC, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Cultural resources are defined as buildings, sites, structures, or objects, each of which may have historical, architectural, archaeological, cultural, or scientific importance.

3.12.1 COMPLIANCE WITH SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

In 1966, Congress passed the National Historic Preservation Act which required all federal agencies to assess the effects of any agency-sponsored undertaking on cultural resources. Under NEPA (42 U.S.C. Sections 4321 through 4327), federal agencies are required to consider potential environmental impacts and appropriate mitigation measures for projects with federal involvement. The FAA process for consultation is established by regulations outlined in 36 CFR 800, as identified in 36 CFR 60.4.

There are four evaluation criteria to determine a resource's eligibility to the National Register of Historic Places (NRHP). These evaluation criteria, listed in **Section 4.12**, are used to assist in determining what

properties, if any, should be considered for protection from destruction or impairment resulting from project-related activities (36 CFR 60.2).

3.12.2 AREA OF POTENTIAL EFFECTS

For the proposed undertaking, FAA used the boundaries of the entire area that would have physical disturbance to delineate the APE. FAA determined these boundaries through consultation with CCSF on the extent of the Proposed Action Alternative. Because the proposed undertaking will not affect the number or type of aircraft using the Airport, FAA delineated a direct effects APE only. There would be no change in the indirect effects from aircraft noise resulting from the proposed undertaking. **Figure 3.1-1** shows the APE (Physical Disturbance Area) for the proposed RSA sites. This figure shows the APE shown on an aerial photo of the Airport. The State Historic Preservation Officer concurred with the use of this APE for the Section 106 consultation process in a letter dated February 1, 2011. This letter is included in **Appendix D1**.

Figure 3.12-1 shows the APE on a portion of a U.S. Geological Survey Quadrangle. This APE for this undertaking is a discontiguous APE that includes the ends of each of the runways where runway safety area work must occur. The FAA identified a discontiguous APE because there is no construction work for the RSA program in the center portion of the runways. The APE at the runway ends includes the various demolition, construction and navigational aid work described in the enclosed listing. The APE also includes a small portion of the Airport's vehicle service road near the approach end of Runway 1R that CCSF must move. The APE also includes the CCSF-owned wooden trestles extending out into San Francisco Bay that support the FAA's Approach Lighting System for three of the runway ends at the Airport. CCSF plans to use staging areas, currently used by the Airport for various current construction and maintenance activities, for the Proposed Action Alternative. Therefore, the direct effects APE does not include any new staging areas.

3.12.3 ARCHAEOLOGICAL RESOURCES

3.12.3.1 Record Search and Literature Review

On January 4, 2011, a record search and literature review from the Northwest Information Center (NWIC) of the California Historic Resource Information System at Sonoma State University was received for the SFO RSA Program (NWIC File No. 10-0587). NWIC serves as a regional clearinghouse of the State Historic Preservation Office. The purpose of the record search was to ascertain whether any cultural resources had been previously identified within or adjacent to the Airport property and to identify any previous cultural resources investigations that may have included the current APE. The requested research included a review of ethnographic and historic literature and maps, federal, state, and local inventories of historic properties, archaeological base maps and site records, and survey reports on file at the NWIC.

The record search revealed no recorded archaeological sites within or adjacent to the APE.

LEGEND

Area of Potential Effects

0 1,000 2,000 Feet

N

AREA OF POTENTIAL EFFECTS

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 3.12-1

U:\GIS\SFO_RSA\Projects\EA\Fig3_12_1APE_quadmap.mxd 11/28/2011 11:53:42 AM

Source: USGS 7.5-minute quadrangles, San Francisco South (1981), Hunters Point (1981), Montara Mountain (1981), and San Mateo (1980)

3.12.3.2 Native American Consultation

The FAA consulted with the California Native American Heritage Commission (NAHC) to identify Native American Tribes that may have input on concerns that uniquely or significantly affect those Tribes related to planned and proposed airport improvements, or may have information about, or be interested in, the proposed undertaking. The California NAHC responded by letter dated January 4, 2011, providing contact information for various Native American Tribes and individuals. The California NAHC's letter also indicated that review of their Sacred Lands File failed to indicate the presence of Native American cultural resources in the immediate project area.

The FAA sent ten letters to the following tribes: Amah/Mutsun Tribal Band, Indian Canyon Mutsun Band of Costanoan, Muwekma Ohlone Indian Tribe of the San Francisco Bay Area, The Ohlone Indian Tribe, Trina Marine Ruano Family, and two individuals recommended by the NAHC. The FAA received one telephone call in response to its letters; the caller recommended that a Native American monitor be present during any work conducted near the original shoreline of San Francisco Bay. The caller also noted there were a number of archaeological sites near Hunter's Point. No written responses were received by the FAA from Native American Tribes.

3.12.3.3 Field Reconnaissance

On February 18, 2011, a windshield reconnaissance and limited pedestrian survey of the SFO RSA Program APE was conducted. Due both to security issues and the fact that SFO was in active use at the time of the survey, an intensive survey of the APE was not possible. This approach was considered adequate for identifying archaeological resources as the entire APE for archaeological resources has been constructed on fill, imported during the twentieth century and is thus unlikely to contain intact archaeological deposits predating the Airport. Furthermore, much of the ground surface is obstructed by large expanses of pavement and the remaining unpaved portions of the APE are subject to routine maintenance, including mowing and occasional grading.

3.12.4 HISTORIC ARCHITECTURAL RESOURCES

3.12.4.1 Record Search and Literature Review

Research relating to the historic context for the project vicinity and site-specific research was conducted. This included the NWIC search results discussed in **Section 3.12.3.1**. In addition, the SFPUC, SFO Bureau of Planning and Environmental Affairs, San Francisco Public Library, and various online sources were consulted.

Many of the research materials reviewed have been adapted and modified from a cultural resources assessment prepared in 2000 for the purpose of determining the eligibility of properties at SFO for inclusion on the NRHP or the CRHR: *"Final Historical Resources Report: Information Regarding the Eligibility of Properties at San Francisco International Airport for Inclusion on the National Register of Historic Places or the California Register of Historic Places"* (ESA, 2000). The report summarized the information contained in three previous studies conducted at SFO: (1) the *San Francisco International Airport Master Plan Final Environmental Impact Report* (San Francisco Department of City Planning, 1992) *and the Cultural Resources Evaluation for the San Francisco International Airport Master Plan*

Environmental Impact Report (Chavez and Hupman, 1991); (2) the *Final Environmental Assessment, Airport Master Plan Improvements, San Francisco International Airport* (San Francisco International Airport, 1998); and (3) the *Cultural Resources Survey: U.S. Coast Guard Air Station, San Francisco, California* (Carey & Co., 1998).

The NWIC records search revealed that no previously recorded historic architecture resources were recorded within the APE.

3.12.4.2 Field Reconnaissance

On February 18, 2011, a historic architecture reconnaissance field survey of the APE was performed to account for buildings and structures that are known to be or appeared to be more than 45 years of age (i.e., constructed in 1966 or earlier) and require additional study. Prior to fieldwork, primary and secondary sources concerning the APE were reviewed as described in **Section 3.12.4.1**. The State of California Department of Parks and Recreation 523 forms were prepared for two historic-period resources that were identified in the APE.

3.13 NATURAL RESOURCES AND ENERGY SUPPLY

3.13.1 NATURAL RESOURCES

Within the GSA, mining activities for oil, coal, natural gas, sand, gravel, and crushed stone do not occur; no important known deposits of such resources exist within the GSA.

The SFPUC provides SFO water from three major sources: the Hetch Hetchy Reservoir in the Sierra region; rainfall and runoff in the Alameda Watershed, which is in Alameda and Santa Clara counties; and rainfall and runoff in the Peninsula Watershed in San Mateo County. Water resources are used for airport-related activities, including aircraft/vehicle washing, irrigation, and potable water (drinking water). **Section 3.7,** Water Resources, includes additional information regarding water resources at SFO.

3.13.2 ENERGY SUPPLY

Pacific Gas and Electric (PG&E) supplies electricity to SFO via three 12-kilovolt feeders sourced by aboveground high-voltage transmission lines, the Millbrae substation, and substations on the southern half of the Airport's West-of-Bayshore property. Both the power and telecommunications lines maintain 100-foot-wide easements along the entire alignment. In addition to electricity provided by PG&E, SFO installed 50,000 square feet of solar panels on the roof of Terminal 3 to supply electricity to the terminal. PG&E also supplies natural gas to SFO via an underground pipe (north-south alignment) that extends across the eastern portion of the West-of-Bayshore property.

3.14 HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

An assessment was conducted in order to identify sites and facilities that are known, suspected, or likely to contain or store hazardous substances and to identify areas of known subsurface soil and/or groundwater contamination. For the purposes of this assessment, the term hazardous materials also includes the regulatory-defined terms of hazardous wastes, hazardous substances, and dangerous

goods; contamination to soil, surface waters and groundwater; as well as the assortment of similarly regulated substances such as fuel and other petroleum-based products. Because the description and assessment of hazardous materials, pollution prevention, and solid wastes at SFO is largely based on the compilation and evaluation of information previously developed or disclosed by others, the approach to completing this assessment consisted of the following:

- Collection and review of reports, maps, and other relevant documents relating to subsurface environmental conditions at SFO. These include site investigation and proposed remedial action documents as well as maps, figures, and exhibits depicting sites and facilities of potential relevance; and
- An independent electronic database survey of federal, state, and local agency files pertaining to hazardous waste sites and environmental contamination in the vicinity of SFO.

3.14.1 Hazardous Materials Regulations

Regulatory agencies involved in the management of hazardous materials, pollution prevention, and solid wastes in the GSA are listed in **Table 3.14-1**.

Table 3.14-1
Regulatory Agencies Involved in Hazardous Materials, Pollution Prevention and Solid Waste in San Mateo County

Agency	Roles and Responsibilities
U.S. Environmental Protection Agency Region 9	*Federal agency* – Sets national policies for solid and hazardous wastes, hazardous materials and environmental contamination under the federal RCRA, CERCLA and other federal regulations.
California Environmental Protection Agency	*State agency* – Establishes statewide policies and rules governing solid wastes, hazardous materials and environmental contamination through the DTSC, RWQCB, and OEHHA.
San Mateo County Environmental Health Services Department	*Local agency* – Serves as the CUPA and the LEA and enforces federal and state regulations countywide pertaining to hazardous materials, solid wastes and USTs/ASTs.

Notes:

AST = aboveground storage tank
CERCLA = Comprehensive Environmental Response Compensation and Liability Act
CUPA = Certified Unified Program Agency
DTSC = Department of Toxic Substances Control
LEA = Local Enforcement Agency
OEHHA = Office of Environmental Health Hazard Assessment
RCRA = Resource Conservation and Recovery Act
RWQCB = Regional Water Quality Control Board
UST = underground storage tank

Table 3.14-2
Relevant Potential Hazardous Waste Release Sites
In the Vicinity of San Francisco International Airport

EDR ID	Name	Address	Listing Type	Listing Type and Description
A 14	Chevron Gas Station #4000	San Francisco International Airport	CA FID UST	This CA FID UST listing does not indicate a release; however, the geotracker record for this site indicates a release in 1984 and a case closure in 2009. Although a closure was granted this site warrants further review because it is mapped by EDR in close proximity to the areas that will be disturbed and residual contamination may have been left in place with regulatory agency approval.
A 16	SCR-Shell Oil, Satellite II	San Francisco International Airport	HIST Cortese	No details are provided for this listing of Shell Oil that may represent a release.
A 27	San Francisco Airport South Terminal	San Francisco Airport South Terminal	ERNS	This listing refers to a 65,000-gallon jet fuel release from a broken pipeline in November 1988. The exact location of the release is not available.
A 31	Cargo Building San Francisco Airport	Cargo Building San Francisco Airport	ERNS	This listing refers to a jet fuel release from a broken pipeline at the TWA Cargo Building in 1990. The exact location of the release is not available.
A 42	Cargo Building San Francisco Airport	Cargo Building San Francisco Airport	ERNS	This listing refers to a jet fuel release inside a sanitary sewer line at the TWA Cargo Building in 1990. The exact location of the release is not available.
A 44	Cargo Building Ramp San Francisco International Airport	Cargo Building Ramp San Francisco International Airport	ERNS	This listing refers to a jet fuel release inside a sanitary sewer line at the TWA Cargo Building in 1990. The exact location of the release is not available.
A 49	Cargo Building Ramp San Francisco International Airport	Cargo Building Ramp San Francisco International Airport	ERNS	This listing refers to a jet fuel release inside a sanitary sewer line at the TWA Cargo Building in 1990. The exact location of the release is not available.
A 50	Cargo Building San Francisco Airport	Cargo Building San Francisco Airport	ERNS	This listing refers to a jet fuel release inside a fiberglass pit at the TWA Cargo Building in June 1990. The exact location of the release is not available.
A 52	Cargo Building San Francisco Airport	Cargo Building San Francisco Airport	ERNS	This listing refers to a jet fuel release inside a sanitary sewer line at the TWA Cargo Building in 1990. The exact location of the release is not available.
A 23	San Francisco Transportation C	Frontage Road, San Francisco International Airport	HIST UST	This HIST UST listing includes 8 former USTs at SFO airport dating as far back as 1969. Some of the USTs contained solvents.
58	Texaco, Inc.	San Francisco International Airport	CERC-NFRAP	CERCLIS No Further Remedial Action Planned – The site was listed in 1980 and the U.S. EPA performed a preliminary assessment in 1985. As a result of the Preliminary Assessment, the U.S. EPA determined that the site would not require additional investigation or remediation under CERCLA.

Table 3.14-2
Relevant Potential Hazardous Waste Release Sites
In the Vicinity of San Francisco International Airport (Continued)

EDR ID	Name	Address	Listing Type	Listing Type and Description
D 74	0	#1 Old Bayshore	CHMIRS	Listed in CHMIRS for an unspecified release in 1988. No other information was provided in the database record.
F 100	0	648 W. Field Rd.	CHMIRS	Listed in CHMIRS for an unspecified release in 2002. No other information was provided in the database record.
AX 478	SFO Fuels	909 North Access Road San Francisco	ICIS	This ICIS listing refers to a violation reported for the SFO Fuels company.
A 17	United Airlines Maintenance Area at San Francisco International Airport	United Airlines Maintenance Area at San Francisco Airport	ERNS	This listing refers to a 23-gallon gasoline spill from a broken hose reported in 1988.
BJ 572	United Airlines Maintenance	Unknown San Francisco International Airport	HIST Cortese	This listing refers to an unspecified release that may be related to the closed LUST BJ569.
BJ 579	United Airlines Service C	Plots 4, 5, and 6, San Francisco Airport	HIST Cortese	This listing refers to an unspecified release that may be related to the closed LUST BJ569.
BJ 575	United Airlines MOC	Unknown San Francisco International Airport	HIST Cortese	This listing refers to an unspecified release that may be related to the closed LUST BJ575.
657	United Airlines – San Francisco Maintenance Center	Maintenance Operations Center, Building 49	RCRA-LQG	This site is listed as a RCRA-LQG with numerous violations discovered from 1988 to 2009. Some of the violations were referred for penalties and some are not listed as having been closed with the respective agencies.
Unlisted	San Francisco Airport Boarding Area B		Unlisted	San Francisco Airport Boarding Area B is currently undergoing remediation under RWQCB oversight for historical jet fuel releases attributed to TWA. Petroleum hydrocarbons were present in groundwater adjacent to Boarding Area B as free-phase product with thicknesses up to 2 feet in 2010. Remediation from 1994 to 2010 has consisted of periodic free-phase petroleum hydrocarbon removal from onsite wells. This site is located north of the southern end of Runway 1L.

Sources: EDR and GeoTracker

Notes:
CA FID UST = California Facility Inventory Database Underground Storage Tank List
CERC-NFRAP = CERCLIS (Comprehensive Environmental Response, Compensation and Liability Act) No Further Action Required
CHMIRS = California Hazardous Material Incident Reporting System
ERNS = Emergency Response Notification System
HIST UST = Historical Underground Storage Tank List
ICIS = International Construction Information Society
LUST = leaking underground storage tank
MOC = Maintenance Operations Center
RCRA-LQG = Resource Conservation and Recovery Act Large Quantity Generator
RWQCB = Regional Water Quality Control Board
SFO = San Francisco International Airport
TWA = Trans World Airlines
UST = underground storage tank

3.14.2 KNOWN/POTENTIAL SITES

The types, characteristics, and occurrences of hazardous materials and other similarly regulated substances at SFO are typical of most metropolitan airports that offer commercial, cargo, and general aviation services. These services include the fueling, servicing, and repair of aircraft, GSE, and motor vehicles; the operation and maintenance of the airfield, main terminal complex and parking facilities; and a range of other special-purpose facilities and operations connected with aviation (i.e., rental car and air cargo facilities, navigation and air traffic control functions). The U.S. Coast Guard Air Station[2] San Francisco base is also located at SFO adjacent to Sea Plane Harbor. Off-airport activities within the GSA include a mixture of industrial, commercial, warehousing, and residential uses.

The largest overall quantities of substances used at SFO that are classifiable as hazardous include aircraft and motor vehicle fuels. Other, smaller amounts of petroleum-products (e.g., lubricants and solvents), waste materials (e.g., used oils, filters, cleaning residues, and spent batteries) and manufactured chemicals (e.g., herbicides, fertilizers, paints, fire-fighting foam, deicing fluids) are stored in various locations throughout the Airport. These materials and substances are characteristically used on a routine basis in support of aircraft, GSE, and motor vehicle maintenance activities and for a range of other similar functions to operate the Airport and to meet aviation safety requirements.

Several sites and facilities at SFO and off airport are known, or have the potential, to contain hazardous materials and/or other regulated substances or have been identified as a confirmed hazardous waste release site. In order to assess these sites of potential concern, a database containing federal, state, and local regulatory agency file information was searched to support this assessment (EDR, 2011a). This database report was used as a screening tool to identify known hazardous materials release sites, generators of hazardous waste(s), underground storage tank (UST) sites, etc., that are reported to be present in the GSA. The Environmental Data Resources (EDR) records search identified a total of 269 sites listed within 0.25 mile from the APE that would potentially be disturbed for construction of the SFO RSA Program that were evaluated in greater detail. Sites were eliminated from further analysis as appropriate, if regulatory agency closure was obtained after site investigation and remediation of the release, or if it was apparent from descriptive location information that the release did not occur in the vicinity of the APE. Approximately 19 of the 269 reported hazardous waste release sites are known to be, or have the potential to be, within the vicinity of the APE. The releases at these sites may have resulted in groundwater or soil contamination, and the status of final actions to rectify the release cannot be determined based on database records. **Table 3.14-2** summarizes the EDR database report information for these 19 sites; approximate locations (based on EDR database data) of four of the 19 sites (that are located within the Airport Boundary) are shown on **Figure 3.14-1**. In addition to the EDR database search a review of the GeoTracker database was performed for sites relevant to this analysis that may not have been mapped by EDR. The SFO Boarding Area B site was identified in the GeoTracker database and was not mapped by EDR. Relevant documents regarding this site were reviewed and it was added to the list of potential sites included in **Table 3.14-2**. The releases at the sites identified have primarily been of petroleum hydrocarbons from leaking USTs and jet fuel releases from surface spills and below-grade pipeline leaks.

[2] The U.S. Coast Guard Air Station is federally owned and managed land on SFO. The CCSF only provides infrastructure support such as utilities and security.

POTENTIAL HAZARDOUS WASTE RELEASE SITES

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 3.14-1

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In addition to these reported release sites, historical maps and photographs indicate that SFO was incrementally developed by filling portions of SF Bay from 1927 to 1973. These fill materials may have included hazardous materials (EDR 2011b, 2011c, 2011d).

3.14.3 SOLID WASTE COLLECTION AND DISPOSAL

The main facilities that generate solid waste at SFO include the passenger terminals, cargo facilities, and aircraft maintenance and service centers. The Airport contracts with South San Francisco Scavenger Company (SSFSC) to provide solid waste disposal services. Some Airport tenants have their own waste disposal contracts with South San Francisco Scavenger Company or other companies. Locked dumpsters are distributed throughout SFO for waste collection and SSFSC is contracted to collect and transport solid waste and recycling to its Blue Line Transfer Station, where waste is sorted. After processing at the Blue Line Transfer Station, the residual waste is transported to Ox Mountain Landfill near Half Moon Bay. Ox Mountain Landfill's capacity for accepting solid waste is estimated to be available through 2018 (Cal Recycle, 2011).

3.15 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

This section describes cumulative actions in the EA study areas for the purpose of considering potential cumulative impacts in **Section 4.16**, Cumulative Impacts, of this EA.

Table 3.15-1 lists and describes past, present, and reasonably foreseeable future projects at, or in the vicinity of, SFO that have been considered in this EA for potential cumulative impacts in the resource categories evaluated. Spatial and temporal boundaries were delineated to ascertain appropriate parameters for analysis of cumulative effects. Projects considered in this evaluation meet three criteria:

- The project has the potential for impacts to all or some of the resource categories evaluated in this EA;
- The spatial boundary includes a geographic area close enough to the Airport that there may be a potential for it and the Proposed Action Alternative to have additive impacts to any resource category; and
- The temporal scope includes projects that have occurred or will occur in a timeframe similar to that of the Proposed Action Alternative, such that there is the potential for additive impacts on any resource category.

For this EA, 28 actions meet the criteria described above. The GSA was used to define the spatial boundary. As shown in **Table 3.15-1**, the timeframe ranges from 2005 through 2015. General types of on-airport projects include, but are not limited to, runway reconstruction, terminal redevelopment, roadway development, installation of Runway Status Lights, and ATCT relocation; while off-airport cumulative projects include a medical center, ferry terminal, office buildings, roadway projects, and a business park.

Table 3.15-1
Past, Present, and Reasonably Foreseeable Future Actions

	Project Name	Location	Description
PAST (2005 to 2010)	Shoreline Protection and Security Project	On SFO Property	Construction of a seawall with a lineal length of 14,175 feet and 10 feet high, within BCDC jurisdiction.
	SFO Executive Airport Addition and New Hangar C	On SFO Property	Addition of approximately 2,400 sf to the existing 26-foot tall, 10,000-sf Executive Terminal, built in 1996, and construction of a new 37-foot-tall, 25,000-sf aircraft storage Hangar C containing approximately 4,000 sf of hangar service office space at the northern edge of SFO.
	Runway 1-19L Overlay and Reconstruction	On SFO Property	Reconstruction of approximately 200,000 square yards of runway and taxiway pavement. The project will overlay and reconstruct Runway 1R-19L to repair deteriorating pavement, improve the surrounding drainage system, upgrade the electrical runway and taxiway lighting system, and repaint runway markings to improve visibility and improve safety for aircraft on the airfield.
	Runway 28R-10L Overlay and Reconstruction	On SFO Property	Repair structural damages on Runway 10L-28R to level the runway profile, widen shoulder pavement, upgrade electrical lighting system, and to incorporate the most current FAA design guidelines pertaining to the runway-related issues.
	Peninsula Medical Center Replacement (Notice of Determination Sept. 2005)	El Camino Real/Trousdale Drive, Burlingame	Replacement of the existing Peninsula Medical Center Hospital and related medical office buildings with a new hospital, medical office building, and parking garage. The project is proposed in part to comply with the seismic upgrade requirements of the Alfred E. Alquist Hospital Facilities Seismic Safety Act of 1994 (SB 1953). The existing hospital will be demolished after the replacement project is built. The replacement project will consist of an approximately 440,000 sf, six- to seven-story hospital building, attached to an approximately 150,000 sf, five-story medical office building, and a separate parking garage with approximately 809 spaces, as well as approximately 681 surface parking spaces. The project additionally includes a helipad and various street and pedestrian improvements.
PRESENT (2011)	Terminal 2 Redevelopment	On SFO Property	Renovation of Terminal 2 to convert the facility from a 10-gate international terminal to a 14-gate domestic terminal. The renovation project included the terminal building's interior space, including holdrooms, concession spaces, baggage claim areas, and building systems.
	Hydrogen/Hythane Fueling Station	On SFO Property	Construction of a fueling station, located on South McDonnell Road and Millbrae Avenue, that would dispense two types of alternative fuels – pure hydrogen and hythane, a mixture of hydrogen and CNG. Approximately 5,000 sf of the 45,000-sf lot would be developed under this project.
	Water Emergency Transportation Authority South San Francisco Ferry Terminal	Oyster Point Boulevard/Marina Boulevard, South San Francisco	Construction of a ferry terminal (passenger waiting area, gangway ramp and float), bus terminal, striping for 56 vehicles, and reconfigured circulation and access. About 124 berths would be removed to create a path for entering and exiting ferries. Dredging under this project would occur at the entrance channel and inner basin area to accommodate ferries.
	Millbrae Wastewater Pollution Control Plant Flow Equalization	Millbrae Avenue/U.S. 101, Millbrae	Installation of a new 1.21 million-gallon flow equalization tank and associated pump stations, pipeline, and other appurtenances at the City's Wastewater Pollution Control Plant. The project will also replace and or upgrade other onsite facilities and will construct a new 8,400-sf Operations Center.
	The Crossing, Parcels 3 and 4	El Camino Real/I-380, San Bruno	Construction of 350 residential units, of which 187 will be condominium units and 163 will be apartment units. The units will be in two buildings; Building 1 will contain the 163 apartment units and Building 2 will contain the 187 condominium units. The buildings will be 5 stories with two levels of subterranean parking.
	249 East Grand Avenue, Office/R&D	249 E. Grand Avenue, South San Francisco	Construction of four Office/R&D buildings totaling approximately 540,000 sf, and a four-level parking garage on a 15.75-acre site.
	Terrabay Phase II/III	U.S. 101, fronting Airport Blvd, South San Francisco	Construction of two office towers totaling 665,000 sf, 24,000 sf of commercial space, a 200-seat performing arts center, and a 100-child daycare center.
FUTURE	Airport Traffic Control Tower Replacement	On SFO Property	Replacement of the existing Airport Traffic Control Tower (ATCT), originally built in 1981 and structurally integrated into Terminal 2. A 2006 seismic analysis found the ATCT and Terminal 2 building required significant structural upgrades to meet seismic, building, and fire code requirements. Terminal 2 renovation was completed in April 2011. The existing ATCT will be demolished upon construction of the new ATCT, to be completed by 2015. The ATCT is undergoing a separate environmental review by the Federal Aviation Administration.

Table 3.15-1
Past, Present, and Reasonably Foreseeable Future Actions (Continued)

	Project Name	Location	Description
FUTURE (2012 to 2015)	Boarding Area E Renovation	On SFO Property	Renovation of airfield and terminal system to improve the baggage handling system, utilities, moving conveyances, telecommunications, terminal systems, architectural improvements, holdroom seating, and building code compliance upgrades.
	Reconstruction of aircraft aprons at Boarding Areas C, E, F, G, and Plot 40	On SFO Property	Reconstruction of the aircraft parking aprons to repair deteriorating and unlevel pavement and underground utilities. Plot 40 is immediately east of the Signature Terminal and is used by United and American airlines. Underground utilities may include storm water drainage, apron lighting, and water. The project is needed to maintain serviceability of the pavement and to replace the existing pavement due to normal wear and tear on the pavement from heavy usage. The areas are the probable limits of the proposed apron and taxilane reconstruction areas, for a combined project total area of approximately 546,000 square yards.
	Terminal 1 Renovation and Boarding Area B	On SFO Property	Renovation of Terminal 1 and phased redevelopment of Boarding Area B. The terminal building and Boarding Area B were built in the 1960s. Boarding Area C was built in the 1980s. The demolition and reconstruction of existing Boarding Area B was to occur in two phases and is described in the Master Plan and in the Master Plan EIR. In 2006, the Airport initiated a planning study for the redevelopment of Terminal 1. As of June 2010, the implementation time frame begins with preparatory work in 2011 to completion in 2026.
	South McDonnell Road Realignment	On SFO Property	Realignment of South McDonnell Road generally from Millbrae Avenue to the International Terminal G area to create additional overnight aircraft parking spaces on the airfield side.
	Reclaimed Water System Project	On SFO Property	Construction of, the secondary effluent treatment system at MLTP to meet the requirements of Title 22 water for reuse as nonpotable water throughout the Airport. Phase I includes installation of underground pipelines to distribute treated water from the MLTP to storage tanks at Lot C, construction of tertiary and advanced treatment facilities at the MLTP; construction of an advanced treatment facility and hydro-pneumatic tank at Lot C; retrofitting of five (5) existing storage tanks at Lot C; and the installation of distribution pipelines from the MLTP to Lot C and the Terminal 2 Building. Phase II includes construction of one (1) tertiary and two (2) advanced treatment facilities; installation of a distribution system; the retrofitting of storage tanks; and the installation of the Supervisory Control and Data Acquisition system. In Phase III, irrigation pipelines would be installed along the McDonnell Road corridor.
	U.S. 101/Broadway Interchange	U.S. 101/Broadway, Burlingame	Reconfiguration of the U.S. Highway 101/Broadway Interchange in Burlingame, California, by the California Department of Transportation, in cooperation with the San Mateo County Transportation Authority. The purpose of the project is to improve traffic movements and access around the interchange, accommodate future traffic increases at adjacent intersections, improve operations at the southbound U.S. 101 ramps, and increase bicyclist and pedestrian access. The length of the project is 0.76 mile.
	San Bruno Caltrain Station Relocation	San Mateo Ave/San Bruno Ave, San Bruno	Relocation of San Bruno Caltrain station, and grade separation of the right-of-way
	406 San Mateo Mixed-Use Project	406 San Mateo Ave, San Bruno	Demolition of the old theater building and three adjacent bars in downtown to construct a mixed-use building with 48 condominium units, 14,600 sf of ground floor retail, and 152 parking spaces.
	Pacific Bay Vistas (former Treetop Apartments)	4300 Susan Drive (Skyline Blvd./Sharp Park Rd), San Bruno	This project has been approved for two different alternatives: (1) The demolition of 308 existing units and construction of 510 new apartment units; and (2) the renovation of the existing 308 apartment units, construction of a new clubhouse/leasing office and associated site and landscape improvements.
	350 Beach Road (former Burlingame drive-in theater)	350 Beach Road, Burlingame	Construction of new office/life science campus consisting of four buildings and a total of 730,000 sf of floor area on an 18.13-acre site. Two 5-story, one 7-story, and one 8-story building are also proposed, along with a five-story parking structure. All buildings will be on the site of former Burlingame Drive-In Theater.
	Britannia Point Grand Development	250-270 E. Grand Avenue, South San Francisco	Demolition of four existing buildings and construction of three Office/R&D buildings (461,500 sf total) and an 8-level parking garage on property located in a 30.5-acre site.
	494 Forbes, Office/R&D	494 Forbes Blvd, South San Francisco	Construction of two four- to five-story Office/R&D buildings totaling 326,020 sf and a three-level parking structure on a 7.48-acre site.
	Gateway Business Park	800-1000 Gateway, South San Francisco	This project consists of Master Plan approval for four parcels totaling 22.6 acres. Gateway Precise Plan includes demolition of two buildings and a childcare facility and construction of two six-story Office/R&D buildings totaling 359,800 sf with a 6-story parking garage on a 8.3-acre site.
	Runway Status Lights	On SFO Property	To minimize potential disruptions to aircraft operations, the project would be constructed on existing runway and taxiway pavement at the same time as the Proposed Action Alternative.

Notes:
AC = Advisory Circular
BCDC = Bay Conservation and Development Commission
CNG = compressed natural gas
EIR = Environmental Impact Report
FAA = Federal Aviation Administration
MLTP = Mel Leong Treatment Plant
R&D = research and development
SB = Senate Bill
sf = square feet
SFO = San Francisco International Airport
U.S. 101 = U.S. Highway 101

CHAPTER 4.0
ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

4.1 INTRODUCTION

The potential environmental effects resulting from implementation of the Proposed Action and No Action alternatives are presented in this chapter. These alternatives are summarized below and discussed in detail in **Chapter 2.0** of this Environmental Assessment (EA):

- Proposed Action Alternative – Improvements to the runway safety areas (RSAs) of Runways 10L-28R, 10R-28L, 1R-19L, and 1L-19R to enhance safety; and
- No Action Alternative – No improvements to the RSAs of Runways 10L-28R, 10R-28L, 1R-19L, and 1L-19R.

The analysis of potential effects on environmental resources discussed in this chapter includes an overview of impacts, methodology, thresholds of significance, and potential construction and operational impacts. Potential impacts are discussed in relation to the study areas and study years (2015 and 2020) defined in **Chapter 3.0**. Potential cumulative impacts resulting from the incremental effects of the alternatives when added to the effects of past, present, and reasonably foreseeable future actions are also analyzed. Where necessary, mitigation measures are discussed that would reduce or eliminate anticipated environmental impacts for each of the alternatives.

In accordance with guidance provided in Federal Aviation Administration (FAA) Orders 5050.4B, *National Environmental Policy Act Implementing Instructions for Airport Actions,* and 1050.1E, *Environmental Impacts: Policies and Procedures* (FAA, 2006c), the following environmental resources are not present within the project area and, therefore, would not be affected by the No Action Alternative or Proposed Action Alternative:

- Farmlands – The nearest important farmlands are 3 miles west and north of the Airport (CDOC, 2008; USDA, 2004);
- Wild and Scenic Rivers – The American (Lower) River, approximately 60 miles northeast of the Airport, in Sacramento, is the closest Wild and Scenic River segment (National Wild and Scenic Rivers, 2011); and
- Coastal Barriers – There are no coastal barrier islands in the vicinity of San Francisco Bay.

4.2 NOISE

This section addresses the future (years 2015 and 2020) aircraft noise environment related to the No Action and Proposed Action Alternatives in the area surrounding San Francisco International Airport (SFO or the Airport), and the methodology used to determine future aircraft noise exposure. The terms and metrics associated with aircraft noise relative to this analysis are complex, and are discussed in detail in **Appendix C1**.

4.2.1 OVERVIEW OF IMPACTS

The Proposed Action Alternative is not expected to change the operational conditions at the Airport. All assumptions remain the same as those defined for the existing condition, except that the location of the

takeoff point and landing point on each runway may change with the shifting of the runway ends to comply with RSA standards.

The Proposed Action Alternative Community Noise Equivalent Level (CNEL) contours would remain substantially unchanged compared to the No Action Alternative condition contours. The Proposed Action Alternative contours show a slight shift to the southwest in a small area localized within a radius of approximately 2,000 feet southwest of Runways 1L and 1R. This minor change in the shape of the CNEL noise contours under the Proposed Action Alternative can be explained by the shift of the thresholds of Runways 1L and 1R by 450 feet and 205 feet, respectively, to the southwest.

No noise-sensitive land uses remain within the existing, future action, and No Action Alternative CNEL 65+ decibel (dB) noise contours because all previously noise-sensitive land uses have been mitigated in previous sound insulation programs. The Proposed Action Alternative considered in this EA would not result in a noise increase in noise-sensitive areas of CNEL 1.5 A-weighted decibels (dBA) or more at or above CNEL 65 dBA when compared to the No Action Alternative in either 2015 or 2020. Therefore, the Proposed Action Alternative would not cause a significant noise impact. No area between the 60 CNEL and 65 CNEL contours would experience an increase of 3 dBA.

4.2.2 METHODOLOGY

It has been assumed for this analysis that the number of aircraft operations, fleet mix, and aircraft flight tracks at the Airport would not change under the Proposed Action Alternative. All assumptions used for future study years are the same as those used for the existing (2010) condition, except that the departure and arrival points on each runway may change with the shifting of the runway ends under the Proposed Action Alternative to enhance the safety of the RSA, as practicable.

Aircraft noise descriptors and the methods for aircraft noise prediction are presented in **Section 3.2**.

4.2.2.1 Operations

The future noise environment for SFO was analyzed based on forecasted operational conditions in 2015 and 2020. The forecast of operations is based on the 2010 FAA-approved aviation demand forecasts (see **Appendix C2**). A total of 407,300 aircraft operations are forecast for the Airport in 2015 and 437,096 operations are forecast for the Airport in 2020. These numbers equate to averages of 1,116 operations (an operation is either one takeoff or one landing) per day in 2015 and 1,197 operations per day in 2020.

Future aircraft fleet mix categories are defined relative to the types of aircraft used to categorize existing operations. The breakdown by category was determined from the 2010 aviation demand forecasts. **Appendix C2** presents operations for the different categories of aircraft for 2015 and 2020.

The mix of aircraft operating at an airport is one of the most important factors in terms of the noise environment. Fleet mix data for SFO were determined from the 2010 forecasts that identified different types of aircraft for future years 2013, 2018, and 2023. For this EA, a linear interpolation between these years was used to determine 2015 and 2020 operations. The fleet mix assumptions are presented in

Appendix C2, indicating the average daily operations for each type of aircraft used in the Integrated Noise Model (INM), as well as a description of these aircraft categories.

In the INM, the aircraft types assigned to the aircraft operating at SFO were based on aircraft in the INM database that most closely matched the projected aircraft fleet mix used in deriving the forecasts. Aircraft accounting for smaller numbers of operations were grouped into the aircraft type that was most representative of the characteristics of those aircraft.

Assumptions such as runway use, time of day, flight tracks and flight track use, and departure procedures remain the same as under the existing condition.

4.2.2.2 Thresholds of Significance

Aircraft noise exposure for existing (2010) conditions and the No Action and Proposed Action Alternatives was analyzed using the methodology described in **Appendix C2**. Results were analyzed to determine if a significant noise impact (as defined in FAA Order 1050.1E, Change 1, Appendix A, Section 14.3) would result from implementation of the Proposed Action Alternative. A brief description of these analyses and results is provided in **Sections 4.2.2.3** and **4.2.2.4** below.

The FAA evaluated the SFO noise environment using methodologies developed by the FAA and published in FAA Order 1050.1E, Change 1. In accordance with FAA Order 1050.1E, Change 1, Appendix A, Sections 14.3 and 14.4c, a proposed action would be considered to have a significant impact with regard to aviation noise if, when compared to the No Action Alternative for the same time frame, it would cause:

- Noise-sensitive areas exposed to CNEL 65 dB or higher to experience a noise increase of at least CNEL 1.5 dB.
- An increase of CNEL 1.5 dB that introduces new noise-sensitive areas to exposure levels of CNEL 65 dB or more.

FAA Order 1050.1E, Appendix A, indicates that for projects in California, CNEL may be used in place of day-night average sound level. See **Appendix C1** for the definition of each. To comply with FAA's guidance provided in Order 1050.1E and the recommendations of the 1992 Federal Interagency Committee on Noise, noise-sensitive areas exposed to noise levels between CNEL 60 and 65 dB should be evaluated for increases of CNEL 3.0 dB or greater if an increase of CNEL 1.5 dB occurs at any noise-sensitive area within the CNEL 65 dB contour.

FAA Order 1050.1E, Change 1, Paragraph 14.4i requires that the following information be disclosed for future conditions:

- The number of people living or residences within each noise contour above CNEL 65 dB, including the net increase or decrease in the number of people or residences exposed to that level of noise; and
- The location and number of noise-sensitive uses (e.g., schools, churches, hospitals, parks, recreation areas) exposed to CNEL 65 dB or greater.

4.2.2.3 Year 2015

No Action Alternative

For the 2015 No Action Alternative, 407,300 annual aircraft operations were modeled in the INM. Aviation activity levels and flight track use are described in more detail in **Appendix C2**. **Figure 4.2-1** shows the CNEL 65, 70, and 75 dBA noise exposure contours modeled in the INM resulting from 2015 aircraft operations at SFO under the No Action Alternative. These contours are a graphical representation of the distribution over the surrounding area of noise from SFO's annual average daily aircraft operations.

As indicated in **Table 4.2-1**, the residential areas within the 65 CNEL contour include an estimated 7,323 housing units that are estimated to house a total of 21,892 residents. A detailed discussion of land uses within the Generalized Study Area (GSA) is provided in **Section 4.3, Compatible Land Use**, of this EA.

Proposed Action Alternative

The same 407,300 annual aircraft operations as used for the No Action Alternative were modeled for the 2015 Proposed Action Alternative. Operational characteristics, including, but not limited to, runway use, flight track use, fleet mix, and day-evening-night split, remain as shown for the No Action Alternative. Runway arrival and departure points and the subsequent flight tracks may shift slightly with the proposed runway shift under the Proposed Action Alternative. Details on aviation activity and flight track use are provided in **Appendix C2**. **Figure 4.2-2** depicts the CNEL 65, 70, and 75 dBA contours modeled noise exposure resulting from the 2015 Proposed Action Alternative.

As indicated in **Table 4.2-2**, the residential areas within the CNEL 65 dBA contour include an estimated 7,373 housing units that are calculated to house a total of 22,044 residents.

4.2.2.4 Year 2020

No Action Alternative

For the 2020 No Action Alternative, 437,096 annual aircraft operations were modeled in the INM. Aviation activity levels and flight track use for 2020 are discussed in more detail in **Appendix C2**. **Figure 4.2-3** shows the modeled CNEL 65, 70, and 75 dBA noise exposure contours resulting from forecast 2020 aircraft operations under the No Action Alternative. These contours are a graphical representation of the distribution of noise over the surrounding area from SFO's annual average daily aircraft operations.

As indicated in **Table 4.2-3**, the residential areas include an estimated 8,903 housing units that are calculated to house a total of 27,059 residents.

Proposed Action Alternative

For the 2020 Proposed Action Alternative, 437,096 annual aircraft operations were also modeled in the INM, the same as for the No Action Alternative. Operational characteristics, including, but not limited to, runway use, flight track use, fleet mix, and day-evening-night split, remain as shown for the No Action

LEGEND

- 65 dB CNEL
- 70 dB CNEL
- 75 dB CNEL

General Study Area

Source
Aerial Photo NAIP, 2009

Acronyms and Abbreviations:
CNEL = Community Noise Equivalent Level
dB = decibel

N

0 4,000 8,000 FEET

NO ACTION ALTERNATIVE NOISE CONTOURS (2015)

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 4.2-1

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PROPOSED ACTION ALTERNATIVE NOISE CONTOURS (2015)

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 4.2-2

NO ACTION ALTERNATIVE NOISE CONTOURS (2020)

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 4.2-3

Table 4.2-1
Land Uses, Noise-Sensitive Sites, Population, and Housing Units within the 2015 No Action Alternative CNEL Contours San Francisco International Airport

Land Use Type	CNEL Contours			
	CNEL 65 to 70 dBA	CNEL 70 to 75 dBA	CNEL 75+ dBA	Total Over CNEL 65 dBA
Number of Noise-Sensitive Sites (Non-Residential)				
Church	---	1	---	1
Park	6	4	1	11
School	8	1	---	9
Total Noise-Sensitive Sites	**14**	**6**	**1**	**21**
Population and Housing Unit Estimates				
Residents	17,170	4,609	113	21,892
Housing Units	5,755	1,536	32	7,323

Source:
Adaptation of data obtained from the U.S. Census Bureau's Census 2000 (2003 Update), and parcel data obtained from the County of San Mateo Property Appraiser (County of San Mateo, 2011).

Notes:
[1] Numbers may not add due to rounding.
[2] Analysis based on best available data.

CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels

Table 4.2-2
Land Uses, Noise-Sensitive Sites, Population, and Housing Units within the 2015 Proposed Action Alternative CNEL Contours San Francisco International Airport

Land Use Type	CNEL Contours			
	CNEL 65 to 70 dBA	CNEL 70 to 75 dBA	CNEL 75+ dBA	Total Over CNEL 65 dBA
Number of Noise-Sensitive Sites (Non-Residential)				
Church	---	1	---	1
Park	5	5	1	11
School	8	1	---	9
Total Noise-Sensitive Sites	**13**	**7**	**1**	**21**
Population and Housing Unit Estimates				
Residents	17,235	4,695	113	22,044
Housing Units	5,768	1,573	32	7,373

Notes:

CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels

Table 4.2-3
Land Uses, Noise-Sensitive Sites, Population, and Housing Units within the 2020 No Action Alternative CNEL Contours San Francisco International Airport

Land Use Type	CNEL Contours			
	CNEL 65 to 70 dBA	CNEL 70 to 75 dBA	CNEL 75+ dBA	Total Over CNEL 65 dBA
Number of Noise-Sensitive Sites (Non-Residential)				
Church	---	1	---	1
Park	5	5	1	11
School	8	2	---	10
Total Noise-Sensitive Sites	**13**	**8**	**1**	**22**
Population and Housing Unit Estimates				
Residents	21,745	5,123	191	27,059
Housing Units	7,122	1,727	54	8,903

Source:
Adaptation of data obtained from the U.S. Census Bureau's Census 2000 (2003 Update), and parcel data obtained from the County of San Mateo Property Appraiser (County of San Mateo, 2011).

Notes:
[1] Numbers may not add due to rounding.
[2] Analysis based on best available data.

CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels

Alternative. Runway arrival and departure points and the related flight tracks may shift based on the proposed shift of the runway ends. Details on aviation activity and flight track use are provided in **Appendix C2**. **Figure 4.2-4** shows the modeled CNEL 65, 70, and 75 CNEL noise exposure contours resulting from the 2020 Proposed Action Alternative.

As indicated in **Table 4.2-4**, the residential areas include an estimated 8,958 housing units that are calculated to house a total of 27,228 residents.

4.2.3 COMPARISON OF THE NO ACTION AND PROPOSED ACTION ALTERNATIVES

Under both future years considered in this EA, when compared to the No Action Alternative, the Proposed Action Alternative would result in an overall decrease in off-airport land within the CNEL 65 dBA contour, while at the same time result in an increase in single-family residences within the CNEL 65 dBA contour. The Proposed Action Alternative would result in an increase of 50 residential housing units and 152 people exposed to CNEL 65 dBA and higher in 2015, and an increase of 55 residential housing units and 229 people exposed to CNEL 65 dBA and higher in 2020. To identify significant impacts that would occur if the Proposed Action Alternative were implemented, the areas exposed to an increase in noise levels of CNEL 1.5 dBA or greater that are at or above the Proposed Action Alternative CNEL 65 dBA were identified. The analysis indicated that areas that would be exposed to this significant increase in noise levels would all be located off the approach ends of Runways 1L and 1R, as shown on **Figures 4.2-5** and **4.2-6**. In both 2015 and 2020, 30 single-family residences would be located within the area that

LEGEND

- 65 dB CNEL
- 70 dB CNEL
- 75 dB CNEL
- General Study Area

Source
Aerial Photo, NAIP, 2009

Acronyms and Abbreviations:
CNEL = Community Noise Equivalent Level
dB = decibel

PROPOSED ACTION ALTERNATIVE NOISE CONTOURS (2020)

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 4.2-4

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Acronyms and Abbreviations:
CNEL = Community Noise Equivalent Level
dB = decibel

LEGEND

- 65 dB CNEL - No Action
- 65 dB CNEL - Proposed Action
- Single Family Residential within the +1.5 dB Difference Area and CNEL +65 dB Contour
- Single-Family Residential
- Multi-Family Residential
- Commercial
- Industrial
- Airport
- Public Use
- Vacant
- Park/Open Space
- Undetermined

N

0 250 500 FEET

Source
Aerial Photo, SFO, June 2009. Existing Land Use: City/County Association of Governemnts- San Mateo County, 2011; Parks, USGS Geogrraphic Names Information System San Mateo County Parcels 2011 San Mateo County Active_Parcels_APN, May 2010

RESIDENTIAL LAND USE WITHIN THE AREA OF CNEL 1.5+ dB CHANGE FOR YEAR 2015

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 4.2-5

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Table 4.2-4
Noise-Sensitive Sites, Population, and Housing Units within the 2020 Proposed Action Alternative CNEL Contours San Francisco International Airport

Land Use Type	CNEL Contours			
	CNEL 65 to 70 dBA	CNEL 70 to 75 dBA	CNEL 75+ dBA	Total Over CNEL 65 dBA
Number of Noise-Sensitive Sites (Non-Residential)				
Church	---	1	---	1
Park	4	5	1	10
School	8	2	---	10
Total Noise-Sensitive Sites	**12**	**8**	**1**	**21**
Population and Housing Unit Estimates				
Residents	21,528	5,494	205	27,228
Housing Units	6,961	1,939	58	8,958

Source:
Adaptation of data obtained from the U.S. Census Bureau's Census 2000 (2003 Update), and parcel data obtained from the County of San Mateo Property Appraiser (County of San Mateo, 2011).

Notes:
1 Numbers may not add due to rounding.
2 Analysis based on best available data.

would experience an increase in noise exposure of at least CNEL 1.5 dBA within the Proposed Action Alternative CNEL 65+ dBA noise contour. Of these 30 residences, all have either been previously provided with sound insulation under the SFO home insulation program described in **Section 3.2.3**, or have been offered sound insulation. Two residences previously declined the offer. Pursuant to California Code of Regulations, Title 21, Section 5014(a)(4), residences that have been offered sound insulation but have declined such insulation are not considered to be incompatible land uses. There is no similar federal determination.

Therefore, no new incompatible land uses would be exposed to an increase in noise levels of CNEL 1.5 dBA or greater within the Proposed Action Alternative CNEL 65+ dBA noise contour as a result of the Proposed Action Alternative in either of the future study years. No area between the 60 CNEL and 65 CNEL contours would experience an increase of 3 dBA. The Proposed Action would not have a significant impact.

While the Proposed Action would not result in significant noise impacts, the Airport will again offer to provide sound insulation to those residences in the area that would experience a 1.5-dB change within the future 65 CNEL contour.

4.2.4 CONSTRUCTION NOISE IMPACTS

Construction activities would temporarily increase ambient noise levels in the immediate vicinity of construction and land clearing activities. Grading and scraping operations are the noisiest, with such equipment generating noise levels as high as 70 dBA to 95 dBA within 50 feet of their operation. The nearest homes would be on the west side of U.S. Highway 101 (U.S. 101), about 800 feet from the

proposed Taxiway A and vehicle service road construction area. Distance rapidly attenuates noise levels, so area residents would likely experience a modest increase in ambient noise levels during construction hours. The potential noise impacts associated with the operation of machinery onsite would be temporary and could be reduced by construction timing and staging. To minimize noise impacts, construction equipment should be maintained to meet manufacturers' operating specifications. Impacts related to the delivery of materials may be minimized by requiring that the contractor use designated haul routes directly connected to U.S. 101 to avoid residential and other noise-sensitive receptors. Overall, construction noise is expected to have a minor and temporary impact.

4.2.5 MITIGATION

The Proposed Action Alternative would not result in significant noise impacts. However, the Airport will again offer to provide sound insulation to those residences in the area that would experience a 1.5 dB change within the future 65 CNEL contour, and whose owners had previously declined insulation.

4.3 COMPATIBLE LAND USE

4.3.1 OVERVIEW OF IMPACTS

Under the Proposed Action Alternative, 30 residential parcels located within the CNEL 65 dBA contour would experience an increase in noise of CNEL 1.5 dBA compared to the No Action Alternative. However, owners of all 30 properties have been offered sound insulation under the SFO residential sound insulation program (RSIP), because the 65 CNEL noise contour historically had encompassed these residences. A total of 28 residential dwellings have been sound insulated and two homeowners declined the noise insulation offer. The number of noise-sensitive uses exposed in 2015 under the Proposed Action Alternative would remain unchanged under 2020 conditions. Therefore, no significant impacts are anticipated as a result of the Proposed Action Alternative compared to the No Action Alternative.

As detailed in FAA Order 1050.1E, the compatible land use section of EAs for airport actions must include documentation to support the required airport sponsor's assurance under Section 511(a)(5) of the Airport and Airway Improvement Act of 1982 [49 United States Code 47107(a)(10)] that appropriate action within the authority of the City and County of San Francisco (CCSF), including the encouragement of the adoption of zoning laws, has been or will be taken, to the extent reasonable, to promote community land use compatibility adjacent to or in the immediate vicinity of the Airport. The land use compatibility assurance letter dated March 1, 2011 is provided in **Appendix C4** of this EA.

4.3.2 METHODOLOGY

As discussed in FAA Order 1050.1E, Appendix A, Section 4, the compatibility of existing and planned land use in the vicinity of airports is usually associated with the extent of the Airport's future noise impacts. If the noise analysis conducted in support of a project concludes that there are no significant impacts, the same conclusion can generally be drawn regarding the compatibility of land use in the areas around the airport. Alternatively, where the noise analysis indicates that significant impacts would occur to noise-sensitive land uses within areas exposed to CNEL 65 dBA or higher, then impacts on compatible land use must be addressed. As discussed in **Section 4.2.2**, the Proposed Action Alternative would be

considered to have a significant impact on a noise-sensitive use when compared to the No Action Alternative for the same time frame, if it would cause:

- Noise-sensitive areas exposed to CNEL 65 dBA or higher to experience a noise increase of at least CNEL 1.5 dBA; or
- An increase of CNEL 1.5 dBA that introduces new noise-sensitive areas to exposure levels of CNEL 65 dBA or more.

In response to Airport-related noise impacts, CCSF began implementation of an RSIP in 1983. Since that time, the program has insulated more than 15,000 homes, eight churches, and seven schools, in various areas of the peninsula exposed to aircraft noise from SFO that were identified as incompatible land uses. For purposes of determining potential noise impacts, properties that have been sound insulated are considered mitigated by SFO under California Title 21. Similarly, those properties where owners have been offered sound insulation but have declined to participate in the program are also considered mitigated. While these properties may potentially be exposed to noise increases as discussed above, they would not be considered noise-sensitive or incompatible land uses.

4.3.2.1 Thresholds of Significance

Table 4.3-1 shows the Federal Land Use Compatibility Guidelines included under 14 Code of Federal Regulations (CFR) Part 150, *Airport Noise Compatibility Planning*, which establish noise criteria for various types of land uses. Under the federal guidelines, residential uses and schools are incompatible with noise levels of CNEL 65 dBA. Other noise-sensitive facilities, such as churches and convalescent hospitals, are considered compatible within the CNEL 65 dBA contour if noise attenuation can be added to the design of the building that would result in a noise level reduction of 25 dBA.

The CLUP, described in **Section 3.3.2.5**, includes noise compatibility criteria for a variety of land uses that may be affected by noise produced by operations at the Airport. Residential uses, as well as the types of noise-sensitive land uses identified in **Chapter 3.0** (i.e., schools, libraries, convalescent hospitals, and churches) are compatible with noise levels up to CNEL 65 dBA. In areas exposed to noise levels between CNEL 65 dBA and CNEL 70 dBA, new development of these uses is considered conditionally compatible pursuant to inclusion of noise insulation features that reduce interior noise levels to CNEL 45 dBA. Furthermore, an update to the CLUP that is currently being prepared includes an avigation easement requirement for new noise-sensitive land uses.

4.3.3 OPERATIONAL IMPACTS (2015 AND 2020)

The following sections describe impacts on compatible land use that would result from changes in aircraft operations resulting from the Proposed Action Alternative. Impacts are discussed under both 2015 and 2020 conditions.

4.3.3.1 No Action Alternative

Under the No Action Alternative, the runway thresholds would not be relocated and RSA-related development would not occur. The forecast growth of aircraft operations would continue through 2015 and 2020 and the noise contour would grow relative to the forecast growth of operations.

Table 4.3-1
Land Use Compatibility With Yearly Day-Night Average Sound Levels

	Yearly Day-Night Average Sound Level					
	Below 65 Decibels	65-70 Decibels	70-75 Decibels	75-80 Decibels	80-85 Decibels	Over 85 Decibels
Residential						
Residential (Other than mobile homes and transient lodges)	Y	N[1]	N[1]	N	N	N
Mobile Home Parks	Y	N	N	N	N	N
Transient Lodging	Y	N[1]	N[1]	N[1]	N	N
Public Use						
Schools	Y	N[1]	N[1]	N	N	N
Hospitals, Nursing Homes	Y	25	30	N	N	N
Churches, Auditoriums, Concert Halls	Y	25	30	N	N	N
Governmental Services	Y	Y	25	30	N	N
Transportation	Y	Y	Y[2]	Y[3]	Y[4]	Y[4]
Parking	Y	Y	Y[2]	Y[3]	Y[4]	N
Commercial Use						
Offices, Business and Professional	Y	Y	25	30	N	N
Wholesale and Retail Building Materials, Hardware and Farm Equipment	Y	Y	Y[2]	Y[3]	Y[4]	N
Retail Trade – General	Y	Y	25	30	N	N
Utilities	Y	Y	Y[2]	Y[3]	Y[4]	N
Communications	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, General	Y	Y	Y[2]	Y[3]	Y[4]	N
Photographic and Optical	Y	Y	25	30	N	N
Agriculture (Except Livestock) and Forestry	Y	Y[6]	Y[7]	Y[8]	Y[8]	Y[8]
Livestock Farming and Breeding	Y	Y[6]	Y[7]	N	N	N
Mining and Fishing, Resource Production and Extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor Sports Arenas, Spectator Sports	Y	Y[5]	Y[5]	N	N	N
Outdoor Music Shells, Amphitheaters	Y	N	N	N	N	N
Nature Exhibits and Zoos	Y	Y	N	N	N	N
Amusement, Parks, Resorts, Camps	Y	Y	Y	N	N	N
Golf Courses, Riding Stables, Water Recreation	Y	Y	25	30	N	N

Table 4.3-1
Land Use Compatibility With Yearly Day-Night Average Sound Levels (Continued)

Notes: The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties remains with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land use for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

Key to Table:

Y (Yes)	Land Use and related structures are compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor to indoor) are to be achieved through incorporation of noise attenuation into the design and construction of structure.
25, 30, or 35	Land use and related structures are generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated in design and construction of structure.

[1] Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor NLR of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems

[2] Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of the buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

[3] Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of the buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

[4] Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of the buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

[5] Land use compatible provided special sound reinforcement systems are installed.

[6] Residential buildings require an NLR of 25 dB.

[7] Residential buildings require an NLR of 30 dB.

[8] Residential buildings not permitted.

Noncompatible land use.

Source: 14 CFR Part 150, Appendix A, Table 1 (1 January 1998).

4.3.3.2 Proposed Action Alternative

Construction activities and the Proposed Action Alternative components are limited to the boundary of the Airport property and would not result in direct changes to existing land uses within the GSA. As shown on **Figure 4.2-5**, a total of 30 single-family residences are located within the year 2015 CNEL 65 dBA contour experiencing a 1.5 dBA increase in CNEL under the Proposed Action Alternative. As shown on **Figure 4.2-6**, the number of homes within the impact area under year 2020 conditions would remain unchanged from 2015 conditions. However, all of these properties have been offered sound insulation under the Airport's RSIP. A total of 28 of these residences has been sound insulated under the RSIP and the owners of the remaining two properties have declined insulation. Therefore, there would be no significant impacts on compatible land use.

4.3.4 Construction-Related Impacts

As discussed in **Section 4.2.4**, noise associated with construction of the Proposed Action Alternative would be temporary and minor in nature and would not significantly impact nearby sensitive receptors; therefore, there would be no construction-related impacts to compatible land use.

4.4 DEPARTMENT OF TRANSPORTATION ACT, SECTION 4(f) AND LAND AND WATER CONSERVATION FUND ACT, SECTION 6(f) RESOURCES

4.4.1 OVERVIEW OF IMPACTS

Neither the No Action Alternative nor the Proposed Action Alternative would result in impacts on Section 4(f) resources due to direct or constructive use impacts. Under the No Action Alternative, the SFO RSA Program would not be implemented and no construction would occur. Under the Proposed Action Alternative, there would be no direct or constructive use of existing park properties or other Section 4(f) resources. None of the existing park facilities within the General Study Area are managed for a quiet setting. Therefore, no significant direct or indirect impacts on Section 4(f) resources would occur.

4.4.2 METHODOLOGY

Direct impacts were determined to occur if acquisition or physical development of Section 4(f) resources would result from the Proposed Action Alternative. Indirect impacts (i.e., constructive use) of Section 4(f) resources were determined by evaluating the projected noise effects that could substantially impair or diminish the activities, features, or attributes of Section 4(f) resources.

4.4.2.1 Thresholds of Significance

FAA Order 1050.1E, Appendix A, Paragraph 6.3 states that a significant impact would occur when a proposed action either involves more than a minimal physical use of a Section 4(f) property or is deemed a "constructive use" substantially impairing the Section 4(f) property, and mitigation measures do not eliminate or reduce the effects of the use below the thresholds of significance (e.g., by replacement in kind of a neighborhood park). Substantial impairment occurs when impacts are sufficiently serious that the value of the site in terms of its prior significance and enjoyment are substantially reduced or lost due to a proposed project (23 CFR 771.135[P][2]).

- A direct impact would constitute actual use of a Section 4(f) resource, including land acquisition and/or physical development of a Section 4(f) resource as a result of the project.
- Constructive use of a Section 4(f) resource would occur where a property identified as being managed for a quiet setting would suffer substantial impairment as a result of the project.

4.4.3 OPERATIONAL IMPACTS (YEARS 2015 AND 2020)

4.4.3.1 No Action Alternative

Under the No Action Alternative, the SFO RSA Program would not be implemented at SFO. Therefore, no significant impacts on Section 4(f) resources would occur.

4.4.3.2 Proposed Action Alternative

Implementation of the Proposed Action Alternative would not directly impact the parks and recreation areas identified in **Section 3.4** or result in an increase in patronage of these areas. The Proposed Action Alternative would not require the acquisition or actual use of property within the surrounding parks and recreation areas. Therefore, no direct impact would occur.

Acronyms and Abbreviations:
CNEL = Community Noise Equivalent Level
dB = decibel

LEGEND

- 65 dB CNEL - No Action
- 65 dB CNEL - Proposed Action
- Single Family Residential within the +1.5 dB Difference Area and CNEL +65 dB Contour
- Single-Family Residential
- Multi-Family Residential
- Commercial
- Industrial
- Airport
- Public Use
- Vacant
- Park/Open Space
- Undetermined

0 250 500 FEET

Source:
Aerial Photo: SFO, June 2009. Existing Land Use, City/County Association of Govermemnts- San Mateo County, 2011; Parks, USGS Geogrraphic Names Information System:San Mateo County Parcels, 2011. San Mateo County Active_Parcels_APN, May 2010

RESIDENTIAL LAND USE WITHIN THE AREA OF CNEL 1.5+ dB CHANGE FOR YEAR 2020

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 4.2-6

A small portion of the south end of the Bayside Manor Park would be exposed to a change in noise of CNEL 1.5 dBA at or above CNEL 65 dBA in both 2015 and 2020. Bayside Manor Park is not managed for a quiet setting because it is already exposed to noise levels of CNEL 65 dBA and higher. The park is, therefore, compatible with the small change in noise levels, and the change would not constitute a substantial impairment to the attributes of this resource. No other Section 4(f) resources occur within the GSA.

4.4.4 CONSTRUCTION-RELATED IMPACTS

Temporary changes to the noise environment during construction would not impact Section 4(f) resources. As discussed in **Section 4.2**, Noise, construction-related noise would be temporary in nature, and no indirect impacts on Section 4(f) resources would occur under the Proposed Action or No Action alternatives.

4.5 SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISK

4.5.1 OVERVIEW OF IMPACTS

The No Action Alternative would not involve implementation of the SFO RSA Program and therefore no socioeconomic, environmental justice, or children's environmental health and safety impacts would occur. The Proposed Action Alternative would not result in the displacement of people, housing or businesses, or population growth; division or disruption of established communities; or disruption of orderly planned development. No development would occur outside of existing Airport property. No residences, businesses, industries, or community facilities/utilities would be acquired; therefore, people would not be relocated. Additionally, no significant influx of people would be attributed to the Proposed Action Alternative. Therefore, no significant direct or indirect impacts would occur under the Proposed Action Alternative.

4.5.2 METHODOLOGY

The socioeconomic data gathered for the GSA were evaluated to determine socioeconomic impacts, the potential for environmental justice impacts, as well as locations where children's environmental health and safety could be affected. Potential direct and indirect effects of the alternatives were evaluated.

4.5.2.1 Socioeconomics

Social impacts were determined through the evaluation of the areas affected by the No Action or Proposed Action Alternative. Potentially affected land, buildings, and transportation facilities were identified using spatial data.

The surface transportation/traffic analysis considered existing and future conditions in the GSA to determine whether implementation of the alternatives studied in detail would result in impacts. Potential direct and indirect effects of the alternatives were evaluated. A direct effect would occur when access to a particular site/area is altered; if additional traffic traveling to/from SFO results; or if additional transportation services are needed. An indirect effect would occur when changes in the planned

development of an area result in increased traffic or transportation needs. Policies of municipal general plans were reviewed to determine whether implementation of the alternatives studied would result in socioeconomic impacts.

4.5.2.2 Environmental Justice

U.S. Department of Transportation (DOT) Order 5610.2 (DOT Order to Address Environmental Justice in Minority Populations and Low-Income Populations) has been used to undertake this analysis. Environmental justice impacts were evaluated by determining whether minority or low-income households or minority businesses would be affected by the Proposed Action Alternative. The objective of this analysis was to determine whether there would be a disproportionately high adverse impact on minority and low-income populations and households. A locale is a potential environmental justice area of concern, when the minority or low-income population of the analysis area is "meaningfully greater" than that of the surrounding areas. Additionally, any census tracts (CTs) with a median household income below the U.S. Department of Housing and Urban Development, Health and Human Services Poverty Guidelines for a family of four in 1990 and 2000 are identified as potential environmental justice areas of concern.

4.5.2.3 Children's Environmental Health and Safety

Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (April 21, 1997), requires federal agencies to prioritize the identification and assessment of environmental health and safety risks resulting from policies, programs, activities, and standards that may disproportionately affect children. Impacts of the alternatives studied in detail were assessed with regard to compliance with this Order. The location of schools and daycare centers in the GSA were identified, and any specific health concerns for children are qualitatively described.

4.5.2.4 Thresholds of Significance

Potential socioeconomic and social impacts were evaluated based on the following criteria:

- Extensive relocation of residents and availability of replacement housing;
- Extensive relocation of community businesses that would create economic hardship for the community;
- Disruption of local traffic patterns that would reduce level of service on roads in the community; and
- A substantial loss in community tax base.

Potential environmental justice impacts of the Proposed Action Alternative were evaluated based on whether adverse human health or environmental effects disproportionately impacted minorities and low-income populations.

Potential children's environmental health and safety impacts of the Proposed Action Alternative were evaluated based on whether children would be affected disproportionately.

4.5.3 OPERATIONAL IMPACTS (YEARS 2015 AND 2020)

4.5.3.1 No Action Alternative

The No Action Alternative would not result in socioeconomic, environmental justice, children's environmental health and safety, surface transportation and traffic, or public service impacts.

4.5.3.2 Proposed Action Alternative

Socioeconomics and Secondary (Induced) Impacts

The actions associated with the Proposed Action Alternative would take place entirely on existing airport property. No residences, businesses, industries, or community facilities/utilities would be acquired for the Proposed Action Alternative. No disruption of established communities would occur. Changes in the population and workforce in the GSA are projected to be the same as those projected for the No Action Alternative. Therefore, implementation of the Proposed Action Alternative compared to the No Action Alternative would have no socioeconomic impacts on the GSA.

Environmental Justice

No CTs within the GSA can be characterized as having a "meaningfully greater" minority or low-income population. San Mateo County has a minority population of 41 percent. CTs in the GSA have minority populations ranging from 23 to 59 percent. The poverty threshold provided by U.S. Census Bureau for a family of four with two children under the age of 18 is $22,162. The median household income in CTs within the GSA ranges from $81,737 to $100,429. Therefore, implementation of the Proposed Action Alternative compared to the No Action Alternative would have no environmental justice impacts to the communities within the GSA.

An analysis of air quality, noise, and traffic indicates that no significant impacts would occur within the GSA. The Proposed Action Alternative, compared to the No Action Alternative, would not result in disproportionate impacts on any low-income or minority populations within the GSA.

Children's Environmental Health and Safety

As discussed in **Section 3.5**, two daycare facilities are located within the GSA (located west of U.S. 101 and east of El Camino Real). There are no elementary, intermediate/middle, or high schools within the GSA. As discussed in **Sections 4.2** and **4.6**, noise and air quality impacts on these facilities or on residential and recreational areas within the GSA would not exceed applicable thresholds of significance. Therefore, no significant impacts on children's environmental health and safety are anticipated under the Proposed Action Alternative.

Surface Transportation and Traffic

The Proposed Action Alternative is limited to the construction of SFO RSA Program improvements on existing Airport property. The Proposed Action Alternative would enhance aviation safety but would not induce activity, alter airport operations, or increase the number of passengers or aircraft operations at SFO. Consequently, while there may be short-term localized impacts associated with construction

activities, the Proposed Action Alternative would not have any long-term impact on GSA roadways levels of service, disrupt surrounding communities, or result in long-term impacts on local businesses.

4.5.4 *CONSTRUCTION IMPACTS*

Potential air quality impacts would be limited to the immediate vicinity of construction activities and are not expected to impact offsite areas. Therefore, the Proposed Action Alternative would not significantly impact schools and daycare centers. Employment within the GSA would not significantly change as a result of construction of the proposed SFO RSA Program improvements. The construction of the Proposed Action Alternative would not result in a substantial addition to the school district in the GSA due to the construction labor force that exists in the San Francisco Bay Area. Therefore, no significant impacts are expected as a result of construction activities associated with the Proposed Action Alternative.

4.6 *AIR QUALITY*

Two sets of federal guidelines, or requirements, determine the need for, define the type(s) of, and establish the extent of an air quality assessment required for airport-related actions and projects. These include FAA Orders 1050.1E and 5050.4B, and the federal Clean Air Act (CAA), as amended by the Clean Air Act Amendments (CAA Amendments) of 1990. Guidelines for preparing an air quality analysis under the National Environmental Policy Act (NEPA) are also contained in the FAA's *Air Quality Procedures for Civilian Airports and Air Force Bases* (FAA, 1997 and 2004), referred to as the "FAA's Air Quality Handbook and its Addendum." The requirements in all of these documents were followed in preparing the air quality assessment for the SFO RSA Program.

FAA Order 1050.1E states that an air quality assessment prepared under NEPA should include an analysis and conclusions of a Proposed Action Alternative's impacts on air quality and further directs that, when a NEPA analysis is needed, the Proposed Action Alternative should be assessed by evaluating the effects on the National Ambient Air Quality Standards (NAAQS). FAA Order 5050.4B further provides that, for NEPA purposes, environmental analyses must determine if the air quality impacts of any reasonable alternative would exceed the NAAQS for the time periods analyzed. Current air quality in the San Francisco Bay area and attainment of NAAQS standards is discussed in **Section 3.6**. The CAA Amendments require federal agencies to ensure that their actions conform to the appropriate State Implementation Plan (SIP). Conformity is defined as demonstrating that a project or action conforms to the SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards. Federally funded and approved actions at airports are subject to the U.S. Environmental Protection Agency's (U.S. EPA's) "General Conformity" regulations. A conformity determination of the proposed action is required if the total direct and indirect pollutant emissions resulting from a project are above *de minimis* emissions threshold levels specified in the conformity regulations.

4.6.1 *Overview of Impacts*

In accordance with FAA Order 5050.4B, because the number of aircraft operations at, and the aircraft fleet mix serving, SFO would not change as a result of the Proposed Action Alternative, an operational emissions inventory was not prepared and is not required under NEPA.

However, a construction emissions inventory is required to address construction activities associated with the Proposed Action Alternative. Air emissions associated with construction activities consist of carbon monoxide (CO), oxides of nitrogen (NO_X), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide, and volatile organic compounds (VOCs). For the Proposed Action Alternative, the construction emissions would be below the established General Conformity *de minimis* thresholds for all applicable pollutants and construction years and therefore conform to the CAA.

4.6.2 *Methodology*

Activity levels and aircraft/engine assignments for on-road construction vehicles were developed based on requirements and schedules developed by URS for the Proposed Action Alternative. On-road emission factors were computed using region-specific data developed by the California Air Resources Board (CARB) EMFAC2007 emissions model (CARB, 2006a). A schedule of planned construction activities for the Proposed Action Alternative, including vehicle miles traveled and idling time estimates for on-road construction vehicles, was developed by construction subtask. Criteria pollutant emissions associated with these activities were computed by factoring these data against Bay Area-specific emissions factors within EMFAC2007 in grams per mile and grams per idle hour, derived using the EMFAC2007 model.

Construction equipment and fuel type, estimated horsepower, and estimated annual hours of operation required for the construction subtasks were also developed. The annual hours of operation were based on the material use and production rates; generally as a result of an 8-hour-per-day, 7-day-per-week work week. Nonroad exhaust emission factors were calculated using the CARB OFFROAD2007 emissions model (CARB, 2006b). This information was applied to criteria pollutant emissions factors, in grams per horsepower-hour, primarily derived using the OFFROAD2007 model. Notably, because CARB is revisiting some information contained within the OFFROAD2007 model and has issued a draft database of updates for select diesel equipment (i.e., the Off-road Emissions Inventory Database), the OFFROAD2007 emissions information was appended with the Offroad Emissions Inventory Database information where necessary and applicable.

Based on the CARB (URBEMIS2007, Version 9.2.4) emissions model default data (CARB, 2007), the average commute distance for construction employees was set to 9.5 miles (19 miles round trip). Additionally, based on the URBEMIS model default data, 1.25 employees per piece of construction equipment are assumed to access the site daily. Accordingly, the equipment quantities in the construction schedule were factored by 1.25 to estimate the number of employees and by 19 miles per employee per day to estimate employee vehicle miles traveled.

Fugitive dust emissions occur as the result of travel on unpaved roads, site preparation, grading activities, wind erosion, and other land disturbances. URBEMIS provides a worst-case uncontrolled PM_{10}

emissions rate of 38.2 pounds per acre-day. This emissions rate was used to calculate uncontrolled PM_{10} emissions using construction task acreage assumptions, as well as construction task durations. Notably, the CARB specifies in the URBEMIS emissions model that a maximum of 25 percent of this acreage would be disturbed on any given construction day, and that 20 percent of the PM_{10} emissions would occur as $PM_{2.5}$. Lastly, CARB recommends, within the URBEMIS, a 61 percent emissions control efficiency (i.e., 61 percent of the unmitigated emissions would be eliminated) for fugitive dust estimates, which reflect Bay Area Air Quality Management District (BAAQMD) basic mitigation measures which are recommended for all proposed projects in the Bay Area.

Based on CARB default data within URBEMIS, an emission factor of 2.62 pounds of VOC (from asphalt curing) per acre of asphalt material was used to determine VOC emissions from asphalt paving. The construction schedule provided the required tons of bituminous surface material. Equivalent acreage was calculated using a weight of asphalt of 2,111 tons per acre, assuming an 8-inch pavement depth, based on data available from the National Asphalt Pavement Association and FAA Advisory Circular (AC) 150/5320-6E: *Airport Pavement Design and Evaluation* (FAA, 2009a).

4.6.3 THRESHOLDS OF SIGNIFICANCE

The U.S. EPA first promulgated the General Conformity Rule in 1993 to implement the conformity provision of Title I, Section 176(c)(1) of the CAA Amendments of 1990. Section 176(c)(1) requires that the federal government not engage in, support, or provide financial assistance for licensing, permitting, or approving any activity not conforming to an approved CAA implementation plan. The approved implementation plan could be a Federal, State, or Tribal Implementation Plan.

Revisions to the General Conformity Rule are codified in 40 CFR Parts 51 and 93, Subpart W, *Revisions to the General Conformity Regulations, Final Rule* (April 2010). The General Conformity Rule applies to all federal actions except highway and transit programs. The latter must comply with the conformity requirements for Transportation Plans in 40 CFR Part 93, Subpart A.

The General Conformity Rule is designed to ensure that air emissions associated with federal actions do not contribute to air quality degradation or prevent achievement of state and federal air quality goals. In short, General Conformity refers to the process of evaluating federal plans, programs, and projects to determine and demonstrate that they meet the requirements of the CAA and applicable State Implementation Plan (SIP).

Compliance with the General Conformity Rule is based on a comparison of the changes in air emissions (Proposed Action Alternative minus the No Action Alternative) with the *de minimis* thresholds, in accordance with FAA Order 1050.1E. In the Bay Area, with respect to ozone, the *de minimis* thresholds are 100 tons of VOCs and 100 tons of NO_X — the two primary precursors to ozone formation. The *de minimis* threshold for $PM_{2.5}$ is also 100 tons. The *de minimis* thresholds are based on the regional status and designation relative to the NAAQS.

4.6.4 OPERATIONAL IMPACTS (YEARS 2015 AND 2020)

Given that the number of aircraft operations at SFO and the aircraft fleet mix serving SFO would not change as a result of the No Action Alternative or the Proposed Action Alternative, an operational emissions inventory was not prepared and is not required under NEPA (in accordance with FAA Order 5050.4B).

4.6.5 CONSTRUCTION IMPACTS

4.6.5.1 No Action Alternative

Under the federal guidelines, the No Action Alternative represents the existing condition to which the Proposed Action Alternative is compared. Under the No Action Alternative, Airport operational emissions would remain unchanged compared to the Proposed Action Alternative. Secondly, no construction activities would be associated with the No Action Alternative. Therefore, no emissions inventory is required for the No Action Alternative.

4.6.5.2 Proposed Action Alternative

Air emissions occurring as the result of construction activity vary based on the project's duration and level of activity. Construction emissions occur mostly as exhaust products from the operation of construction equipment and vehicles, but can also occur as fugitive dust emissions from land disturbance during material staging, demolition, and movement. Evaporative emissions also result from asphalt paving operations. The type of construction equipment commonly used can be categorized as both off-road and on-road equipment. Off-road equipment is typically used for earthwork, paving, demolition, and other onsite activities, while on-road equipment is typically used to transport and deliver supplies, materials, and employees.

4.6.5.3 Emissions Inventory

Construction activities would take place from 2012 through 2015 as a result of the Proposed Action Alternative, and the emissions inventory for the Proposed Action Alternative is presented in **Table 4.6-1**. The construction-related pollutant emissions were compared against the General Conformity *de minimis* thresholds established for the Bay Area to gauge conformance to the SIP. **Table 4.6-1** presents the results of the construction emissions inventory of criteria pollutants, in tons per year. The worst case construction year would be 2014, in which 67 tons of CO, 3 tons of VOC, 11 tons of NO_X, 52 tons of PM_{10}, and 10 tons of $PM_{2.5}$ are estimated to be emitted.

4.6.5.4 Comparison with Standards

As shown on **Table 4.6-1**, the construction-related emissions of criteria pollutants would be below the established annual *de minimis* thresholds for all construction years. The Proposed Action Alternative would not be expected to cause or contribute to an exceedance of the NAAQS and would conform to the SIP. Therefore, a General Conformity determination is not required for the Proposed Action Alternative. No adverse air quality impacts are expected to result from implementation of the Proposed Action Alternative.

Table 4.6-1
Proposed Action Alternative Construction Emissions Inventory
San Francisco International Airport

Construction Year	Estimated Annual Emissions of Criteria Pollutants (tons/year)				
	CO	VOC	NO_X	PM_{10}	$PM_{2.5}$
2012	22.4	1.1	4.0	8.6	2.0
2013	51.3	2.2	6.6	12.5	3.1
2014	66.5	3.0	10.8	51.7	10.3
Maximum	**66.5**	**3.0**	**10.8**	**51.6**	**10.3**
De Minimis Threshold	100	100	100	-	100
Difference (Under)/Over *De Minimis* Threshold					
2012	(77.6)	(98.9)	(96.0)	-	(98.0)
2013	(48.7)	(97.8)	(93.4)	-	(96.9)
2014	(33.5)	(97.0)	(89.2)	-	(89.7)
Significant?	No	No	No	-	No

Source: General Conformity Rule (40 CFR Part 93, Subpart B), January 31, 1994.

Notes:

CO = carbon monoxide
NO_X = oxides of nitrogen
PM_{10} = particulate matter equal to less than 10 microns in diameter
$PM_{2.5}$ = particulate matter equal to less than 2.5 microns in diameter
VOC = volatile organic compound

4.6.5.5 Greenhouse Gas Emissions and Climate Change

Based on FAA data, aircraft operations at SFO account for less than 1.4 percent of the total U.S. commercial aviation activity.[1] Therefore, assuming that GHGs occur in proportion to the level of activity, GHG emissions associated with existing and future aviation activity at SFO would be expected to represent less than 1.4 percent of U.S.-based GHG emissions.

As noted previously, the number of aircraft operations at, and the aircraft fleet mix serving, SFO would not change as a result of the Proposed Action Alternative; thus, GHG emissions related to SFO operations would not increase as a result of the Proposed Action Alternative. The RSA alternatives would not result in an increase in GHG emissions directly associated with the Proposed Action Alternative in excess of 25,000 metric tons, which is a factor when considering more detailed analysis under draft NEPA guidelines (Council on Environmental Quality, 2010). Therefore, the GHG emissions associated with the Proposed Action Alternative would not be significant.

[1] In 2010, the FAA Air Traffic Activity Data System reported 28,365,430 total towered aircraft operations in the United States. SFO accounted for 396,548 aircraft operations, or 1.4 percent of the total aircraft operations at towered airports in the United States.

Construction activities associated with implementation of the RSA alternatives would result in *de minimis* air quality impacts.

4.6.6 CONSTRUCTION MINIMIZATION MEASURES

Air quality impacts resulting from the Proposed Action would be related to construction activities and are expected to be short term and minimal. Project impacts would not exceed the General Conformity thresholds. Nevertheless, construction-related emissions associated with the Proposed Action Alternative could be further reduced by implementing the following minimization measures recommended by BAAQMD for all construction projects to reduce both fugitive dust and combustion emissions in the San Francisco Bay Area:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
- All haul trucks transporting soil, sand, or other loose material off site shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
- All vehicle speeds on unpaved roads shall be limited to 15 miles per hour.
- A sign visible to the public shall be posted with the telephone number and contact person at the Lead Agency for dust complaints. This person shall respond and take corrective action within 48 hours. The BAAQMD's telephone number shall also be visible to ensure compliance with applicable regulations.
- All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 miles per hour.
- The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities in the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.
- All trucks and equipment, including their tires, shall be washed off prior to leaving the site.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure, Title 13, Section 2485 of the California Code of Regulations). Clear signage shall be provided for construction workers at all access points.
- All construction equipment shall be maintained and properly tuned in accordance with the manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

Permits necessary for implementation of the Proposed Action are listed in **Table 2-4**.

4.7 WATER RESOURCES

4.7.1 OVERVIEW OF IMPACTS

The No Action Alternative would not involve construction of the Proposed Action Alternative and would not result in impacts (direct or indirect) to water resources. There would be a minor change in stormwater discharges associated with the Proposed Action Alternative since approximately 23 acres of permanent impervious surfaces would be added and minor modifications to the storm drain system would be implemented. However, existing grades would remain approximately the same, and no new sources of pollutants would be introduced.

Aircraft and Airport operational impacts on water quality would not change as a result of the proposed project. Furthermore, the proposed project will not induce or alter aircraft activity at SFO upon its completion. Because the Proposed Action Alternative would not induce activity, demand for potable water or wastewater treatment would not differ from the No Action Alternative.

Impacts could be caused by erosion, increased turbidity, sedimentation, and potential accidental or unintentional release of fuels and lubricants. Measures to minimize erosion and sedimentation and maintain water quality throughout the construction phases are available and would be implemented for the Proposed Action Alternative. These include project-specific design measures, best management practices (BMPs), a dewatering management plan, and pollution control plans designed to prevent a project from exceeding applicable water quality standards.

4.7.2 METHODOLOGY

Federal and state statutes regulating water resources were reviewed for the analysis of potential water quality impacts. The applicable statutes establish water quality standards, control discharges and pollution sources, protect drinking water systems, prevent/minimize the loss of wetlands, and protect aquifers and other sensitive ecological areas.

Documents previously prepared for SFO, including the Runway Reconfiguration Feasibility Study and Plan (SFO, 1999), Airfield Seismic Stabilization and Realignment Phase A Engineering Report (SFO, 2006), Storm Water Pollution Prevention Plan (SWPPP) for Industrial Activities (SFO, 2010a), and other available documents were used to assess whether water quality and water resources would be impacted by the Proposed Action Alternative. The review and analysis also included updating the information provided in the previously prepared documents as needed to reflect current conditions and policies. Existing impervious areas and locations where disturbance is proposed were reviewed to evaluate potential direct and indirect impacts on groundwater and surface water resources. A direct effect occurs through increased turbidity and erosion during construction and increased runoff. An indirect effect occurs when changes in the planned development of an area result in increased water needs or reduced water quality.

The potential impacts on water quality were assessed based on the location, preliminary design plans, and intended function of the Proposed Action Alternative.

Increases in potable water consumption and domestic wastewater treatment production were also considered in regard to potential direct impacts or changes in operational activities.

4.7.2.1 Thresholds of Significance

In accordance with FAA Order 1050.1E, an action would be considered to have a significant impact if it would result in any of the following: (1) the potential to exceed water quality standards, (2) water quality problems that cannot be avoided or satisfactorily mitigated, or (3) difficulty in obtaining a permit or authorization.

For projects that have the potential to alter the quality and quantity of stormwater runoff, post-construction stormwater controls would be required if post-development pollutant loads exceed pre-project levels, if the peak runoff flow increases, or if the total runoff volume increases.

4.7.3 OPERATIONAL IMPACTS

4.7.3.1 No Action Alternative

Under the No Action Alternative, although no new facilities would be constructed, operational activities to accommodate forecast growth in aircraft operations and passengers at SFO would be at the same or similar levels to those anticipated under the Proposed Action Alternative. No increases in wastewater generation would occur beyond what would occur as the number of enplaned passengers increase over time according to forecast growth. Therefore, no significant impacts on water quality or water resources are anticipated.

4.7.3.2 Proposed Action Alternative

Surface Water Quality

As detailed in **Section 3.7**, the South Detention Basin and the South Oxidation Pond, located at the south ends of Runways 1R-19L and 1L-19R, respectively, would be filled and the functions would be relocated as part of the Proposed Action Alternative. Stormwater in this vicinity would be directed to a new underground detention basin southeast of the existing location shown on **Figure 1-10**. New catch basins south of the runways would also be installed to capture stormwater in the area. The new detention basin would be sized to accommodate the capacity of the existing South Detention Pond, existing South Oxidation Pond, and any additional runoff that would be generated by the increased impervious surface areas. The storm drainage improvements would maintain drainage patterns similar to the existing patterns and would be sized to retain about 1.6 million gallons. As described, the first flush water would continue to be diverted to the Mel Leong Treatment Plant for treatment.

At the northern end of Runways 1R-19L and 1L-19R, runoff currently flows into a stormwater drainage system that discharges directly to the San Francisco Bay. Stormwater in this portion of SFO would continue to discharge through the stormwater drainage system to existing outfalls. Operational activities in this area would not be altered, and therefore, despite the increase in impervious surfaces due to additional taxiway pavement and Engineered Materials Arresting System (EMAS), no additional sources of pollutants would be introduced.

At the western end of Runways 10R-28L, approximately 10 acres of impervious surface would be introduced, which is small in comparison to the total drainage area of approximately 659 acres in which these surfaces are included. Drainage patterns would remain essentially the same. No new operational activities would take place that would introduce additional pollutants of concern to impact surface water quality.

Stormwater Treatment and Discharge

The Proposed Action Alternative would modify portions of the existing storm drain system, but are not expected to substantially modify overall airport drainage patterns. Stormwater treatment and discharge would remain the same for the majority of the Airport. Currently, stormwater runoff is conveyed to the four detention basins or outfalls by sheet flow and through underground piping and culverts. Modifications to the stormwater drainage system would occur in South Detention Basin's drainage area. As discussed in the previous section, the existing South Detention Basin would be filled for installation of the EMAS bed on the south end of Runway 1L-19R, and an underground replacement detention basin (with a 1.6-million-gallon capacity) would be constructed approximately 1,500 feet to the southeast. Underground piping and culverts would be modified to connect the replacement basin with the existing storm drainage system. Stormwater runoff collected in the replacement basin would continue to be discharged to Mel Leong Treatment Plant – Industrial Waste Process (MLTP-IWP) for first flush treatment; overfill during extended rains would continue to be discharged to the SF Bay. There would be no substantial change in the quantity or quality of the stormwater discharge. Therefore, operational impacts on stormwater treatment and discharge would not be significant.

Operations-Related Water Quality Impacts

The Proposed Action Alternative would have negligible operational impacts because it would not introduce new activities or new pollutants. After construction of the Proposed Action Alternative, runways and taxiways would resume their operational functions. Aircraft activity would not be altered as a result of the Proposed Action Alternative. No additional activities, such as aircraft maintenance, would be implemented as part of the Proposed Action Alternative. Therefore, there would be no adverse water quality impacts from an operational perspective as a result of the Proposed Action Alternative.

Groundwater

Implementation of the Proposed Action Alternative would not require the use of groundwater resources, and operational activities are not expected to change. Therefore, there would be no operational impacts on groundwater resources as a result of the Proposed Action Alternative.

Potable Water

Airport activity and the number of passengers using the Airport will not change as a result of the Proposed Action Alternative. The forecast aviation activity would continue regardless of implementation of the Proposed Action Alternative. Therefore, potable water use after the Proposed Action Alternative would be the same as the No Action Alternative. Furthermore, the Proposed Action Alternative would not require relocation or disturbance of public drinking water supply pipelines or local distribution systems. There would be no adverse impacts on the potable water system as a result of the Proposed Action Alternative.

Wastewater

The generation of wastewater would be the same as under the No Action Alternative because the Proposed Action Alternative would not increase activity or the number of passengers at SFO. Therefore, the Proposed Action Alternative would not impact local wastewater collection or treatment systems.

4.7.4 CONSTRUCTION IMPACTS

Construction activities associated with Proposed Action Alternative have the potential to affect surface water and groundwater quality and would be required to comply with federal, state, and local regulations. Projects involving construction activities that disturb one or more acres are required to apply for coverage under the State Water Resources Control Board's (SWRCB) National Pollution Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, 2009-0009-DWQ as amended by 2010-0014-DWQ (General Permit). To obtain coverage under the permit, SFO would submit Permit Registration Documents that include a Notice of Intent to comply with the general permit, a risk assessment to address project sediment risk and receiving water risk, post-construction calculations, a site map, a project-specific SWPPP for construction activities, and the appropriate fees. BMPs that could be implemented during construction would be identified in the SWPPP. Additionally, post-construction management measures may be prepared and a long-term maintenance plan would be implemented at the completion of construction (this is not a mandatory requirement prior to September 2, 2012).

The Proposed Action Alternative would comply with water quality standards set forth by the State of California in the San Francisco Bay (Region 2) Water Quality Control Plan (Basin Plan) (RWQCB, 2010). In addition, construction activities would adhere to guidelines set forth by SFO's SWPPP (SFO, 2010a), prepared in accordance with the SWRCB General Permit for stormwater discharges associated with industrial activities (Order Number 97-03-DWQ), as well as a project-specific SWPPP. Construction activities would comply with earthwork, mulching, and drainage standards included in FAA Aviation Circular 150/5370-10E, *Standards for Specifying Construction of Airports* (FAA, 2009b) to minimize erosion and sedimentation.

Surface Water Quality

Construction includes site preparation, grading, excavation, and minor drainage improvements. The construction activities have the potential to cause erosion, sedimentation, and increased turbidity in water bodies. Fluids, such as fuel or oils, leaking from vehicles and equipment used during construction have the potential to impact water quality.

Erosion control measures and BMPs would be implemented to minimize the effects of erosion, sedimentation, and leakage of vehicle and equipment fluids. Erosion control measures that may be implemented include, but are not limited to, mulching, temporary seeding, wattles, and silt fencing. Pollution prevention and waste management plans would be developed for the Proposed Action Alternative to address the storage, handling, and disposal of fuel, oils, and other wastes from project construction activities.

Work related to the relocation of the lighting stations and seawall would require construction activities in the SF Bay and tidal marsh, respectively. BMPs such as turbidity curtains or gravel bags would be used to reduce the potential for adverse impacts on water quality. Pollution prevention and waste management plans would also aid in protecting water quality during these construction activities. BMPs and project-specific plans would be implemented to ensure compliance with federal, state, and local water quality regulations.

The implementation of the erosion control measures, BMPs, and pollution prevention plans would protect surface water quality of receiving waters during construction so that there would be no adverse effects on water quality.

Stormwater Treatment and Discharge

Erosion control measures and BMPs, as described under Surface Water Quality, would aid in stormwater treatment during construction activities. The final design for the Proposed Action Alternative would consider, and include appropriate design measures to minimize erosion potential and sediment transport such as maintaining slopes that promote sheet flow and minimizing the limits of construction to reduce exposed land. The contractor would comply with federal, state, and local requirements or guidelines to meet water quality objectives for water discharged.

The implementation of erosion control measures, BMPs, and pollution prevention plans would reduce the potential for construction discharges associated with the Proposed Action Alternative to exceed water quality standards.

Groundwater

During construction, subsurface excavation, clearing, and grading activities could intercept shallow groundwater or expose soils to erosion and sedimentation in onsite drainages, which can affect water quality. Dewatering could be necessary in locations where excavations intercept groundwater. Previous studies have indicated that depth to groundwater at SFO varies in the range of 0 to 17 feet below ground surface (SFO, 2006). Typical excavation depths for the Proposed Action Alternative would be approximately 2 to 4 feet deep for the seawall and electrical substation, approximately 10 feet deep for the glide slope antennae underground fuel tank, and ranging from 10 to 25 feet deep for the pump station/stormwater detention basin (SFO, 2010b).

Construction-related dewatering would be managed and discharged in accordance with the General Permit. If water quality standards outlined in the General Permit cannot be met, an NPDES permit and Report of Waste Discharge may be required for the dewatering activities associated with the Proposed Action Alternative. The SWRCB establishes effluent limitations, discharge specifications, receiving water limitations, and monitoring and reporting requirements for activities requiring an individual discharge permit. Compliance with the permit conditions would minimize the potential for impacts on beneficial uses of water.

A management plan for dewatering activities would be required in accordance with the SFO SWPPP. The management plan would be prepared prior to excavation to specify methods for water collection, transport, treatment, and discharge of all water produced by construction site dewatering.

For areas where the quality of the water or groundwater encountered is not known or the water is suspected to be contaminated, water produced by dewatering would be assessed by visual and olfactory examination and measured for VOCs in accordance with the SFO SWPPP. If no contamination is observed and no VOCs measured, water would be discharged to the MLTP-IWP system or to the San Francisco Bay through the nearest storm drain inlet. If contamination is observed or VOCs are detected, a water sample would be collected and analyzed for the pollutants of concern. Water would be discharged to the industrial waste system if the detected contaminant concentrations are less than the influent requirements established by

SFO for MLTP-IWP. If the contaminant concentrations exceed established influent levels, the water shall be treated. Treated water that meets the established influent requirements for the MLTP-IWP or stormwater influent concentrations may be discharged to the appropriate system (SFO, 2006).

For areas where the quality of the water or groundwater encountered is known or suspected to be contaminated, the following steps would be taken in accordance with the SFO SWPPP (SFO, 2006):

- Review available data to characterize the pollutants of concern and the anticipated or assumed concentrations of these constituents in the water to be evaluated;
- Make provisions based on the available data for treatment of the extracted water by an appropriate treatment method, such as sediment filtration, oil/water separation, carbon filtration, or a combination of these, if necessary;
- Analyze representative samples of water for the pollutants of concern;
- Discharge water to the MLTP-IWP or stormwater collection system (if analytical results indicate that the pollutant concentrations are below laboratory detection limits and/or comparable to concentrations in nonpolluted receiving water);
- Discharge water to the MLTP-IWP provided that contaminant concentrations are less than the influent requirements established by SFO's MLTP-IWP, hydraulic capacity is available, and an MLTP-IWP manhole is accessible (if analytical results indicate that pollutant concentrations exceed laboratory detection limits and/or permissible levels).

BMPs such as sediment basins or sediment traps may be used during construction to provide treatment and ensure that discharges to receiving waters meet applicable water quality objectives set forth in the Basin Plan. Discharges of water produced by dewatering would need to be controlled in a manner that prevents erosion.

Potable Water

Construction of the Proposed Action Alternative would be on the airfield and would not require relocation or disturbance of public drinking water supply pipelines or local distribution systems. Additionally, construction activities are not anticipated to require potable water, and the number of construction workers on site requiring potable water would be minor compared to the existing needs of Airport passengers and employees. Therefore, there would be no adverse impacts on potable water under the Proposed Action Alternative.

Wastewater

Construction of the Proposed Action Alternative would not require relocation or disturbance of the sanitary sewer system. Additionally, construction activities and workers are not anticipated to generate substantial volumes of wastewater that would be discharged into the sanitary sewer system. Therefore, there would be no adverse impacts on the wastewater and the sanitary sewer system under the Proposed Action Alternative.

4.7.5 PERMITS

Permits necessary for implementation of the Proposed Action Alternative are listed in **Table 2-3**.

4.8 FISH, WILDLIFE, AND PLANTS

4.8.1 OVERVIEW OF IMPACTS

The No Action Alternative would have no impacts on vegetation types, wildlife, or threatened and endangered species because the Proposed Action Alternative would not be implemented. The Proposed Action Alternative would result in the loss of approximately 16.0 acres of annual grassland, 2.95 acres of seasonal wetlands, and 0.04 acre of tidal marsh. In addition, 0.73 acre of other waters of the United States (constructed drainage features) would be impacted by the Proposed Action Alternative (see **Section 4.9** for further information).

As described in **Section 3.8**, seven (7) federal and/or state-listed threatened or endangered species are known to occur or potentially occur in the General Study Area. Potential impacts were evaluated for these seven species, including: green sturgeon (federally threatened), longfin smelt (state threatened), Sacramento River winter-run Chinook salmon (federally and state endangered), Central Valley spring-run Chinook salmon (federally and state threatened), Central California coast steelhead (federally threatened), California clapper rail (federally and state endangered), and salt marsh harvest mouse (federally and state endangered). Potential impacts on federal- and state-listed fish species may include injury or mortality from excessive sound pressure levels generated during pile installation activities for the approach lighting systems at the ends of Runways 19L, 28L, and 28R. Impacts on California clapper rail include the loss of 0.04 acre of suitable tidal marsh habitat and potential noise disturbance from construction activities in or adjacent to the marsh (i.e., vehicle service road [VSR] relocation and storm drain outfall pipe replacement).

The FAA, pursuant to Section 7 of the federal Endangered Species Act, is required to consult with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) regarding potential project effects on federally listed species and Essential Fish Habitat (EFH). Both agencies must review the project via Section 7 consultation, which would address anticipated effects on listed species and identify measures that the project must implement to ensure that take of listed species is avoided and minimized. FAA initiated formal Section 7 consultation with the USFWS and NMFS on May 18, 2011. After reviewing the current status of these species; the effects of the proposed project; and proposed measures to avoid, minimize, and compensate for the effects to listed species and designated critical habitat, the FAA has determined that the project: ***may affect and is likely to adversely affect,*** the California clapper rail and has ***no effect*** on the salt marsh harvest mouse. FAA based this determination on the information in the Biological Assessment (BA) that indicates the fill area of the tidal marsh at the edge of the SF Bay is occupied by the California clapper rail. The BA, as submitted by the FAA, is provided in **Appendix E1**. As detailed in the BA, construction of the Proposed Action Alternative could result in incidental take of California clapper rail. Short-term/construction and long-term impacts to the California clapper rail and potential loss of habitat would be mitigated through implementation of measures provided in the BA and summarized below. The FAA has also determined that the project ***may affect, but is not likely to adversely affect,*** green sturgeon, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central California Coast steelhead, as well as EFH for native fish species. As detailed in the BA, potential temporary, construction-related effects to

listed fish and EFH will be avoided and/or minimized through implementation of a variety of avoidance and minimization measures (e.g., seasonal work restrictions, installing silt curtains around work areas, and driving piles during low tides). The NMFS concurred with the FAA's determination on June 16, 2011 (EFH) and November 3, 2011 (listed fish species). The USFWS issued a Biological Opinion on November 28, 2011, to address impacts to California clapper rail. Copies of these letters are included in **Appendix E3, E4,** and **E5.**

Because the California Department of Fish and Game has jurisdiction over state-listed endangered, threatened, and rare species under the California Endangered Species Act, state-listed species in the Area of Potential Effect (APE), such as Chinook salmon and longfin smelt, may require approval under California Endangered Species Act Sections 2080.1 (i.e., via the Consistency Determination process) or Section 2081 (b) and (c) (i.e., via Incidental Take Permit process).

4.8.2 METHODOLOGY

The assessment of potential impacts upon threatened and endangered species was conducted by (1) identifying species potentially occurring within the APE through previous field experience at the airport and database (i.e., USFWS and California Natural Diversity Data Base) research; and (2) identifying potential impacts on habitat potentially occupied by species as a result of the alternatives.

4.8.2.1 Thresholds of Significance

Under Section 7 of the Endangered Species Act (ESA), as amended, the lead federal agency must consult with the USFWS and/or the NMFS to ensure that any agency action is not likely to jeopardize the continued existence of any listed endangered or threatened species. Similarly, under the Magnuson-Stevens Act, the lead federal agency must consult with NMFS regarding any actions that may adversely affect EFH. FAA Order 1050.1E, Appendix A, Section 8.3 also identifies the following threshold for significant impacts on fish, wildlife, and plants:

> "A significant impact to federally-listed threatened and endangered species would occur when the USFWS or NMFS determines that the proposed action would be likely to jeopardize the continued existence of the species in question, or would result in the destruction or adverse modification of federally-designated critical habitat in the affected area."

4.8.3 OPERATIONAL IMPACTS

4.8.3.1 No Action Alternative

Biotic Communities

Under the No Action Alternative, the Airport would continue to operate under its existing runway layout and no improvements beyond those needed for security, maintenance, and safety reasons would be implemented. No impacts on existing vegetation types would be expected.

Protected Species

The No Action Alternative would also not result in impacts on federal or state-listed fish species, and would not result in additional disturbance-related impacts on California clapper rails, beyond those that are already present at the Airport, from day-to-day operations and maintenance activities.

4.8.3.2 Proposed Action Alternative

Biotic Communities

The Proposed Action Alternative would not result in any operational impacts on biotic communities. Once construction is completed, there would be no further impacts on annual grassland and seasonal wetland communities on the airfield, nor to the tidal marsh along the southeastern edge of the airfield. As part of the existing conditions at the Airport, ongoing wildlife hazard management practices include regular mowing, noise disturbance, and wildlife deterrence. Therefore, there would be no new activities resulting in new operational impacts on vegetation communities under the Proposed Action Alternative.

Protected Species

The Proposed Action Alternative would not result in operational impacts on protected species. Construction-related impacts, would be temporary and of short duration, to be completed outside of the breeding season of protected species. Once the piling installation is completed for the modifications to the wooden trestles supporting the approach lighting systems, no further work would be required in the SF Bay. Disturbance levels from routine airfield operations after the Proposed Action Alternative improvements are completed would not be significantly different from pre-project levels. California clapper rails and other tidal marsh wildlife would not have to adapt to increased noise and/or visual disturbance adjacent to the marsh compared to existing conditions.

4.8.4 CONSTRUCTION IMPACTS

Biotic Communities

The Proposed Action Alternative would result in the loss of approximately 16.0 acres of annual grassland, 2.95 acres of seasonal wetlands, and 0.04 acre of tidal marsh. Grassland and seasonal wetland impacts would result from the realignment of several taxiways and fill of a 0.54-acre seasonal wetland/ponding area near the end of Runway 28R to meet FAA Airport Design Standards that RSAs be level and free of obstructions, including standing water. The filling of South Oxidation Pond and Bird Ball Ditch would be required to accommodate the relocated Taxiway A and new stormwater detention pond. The 0.04-acre tidal marsh impact would result from the relocation of the existing VSR around the southern end of Runway 1R.

Protected Species

The projected impacts of the construction of the proposed RSA improvements are summarized in **Table 4.8-1**.

Table 4.8-1
Summary of Project Effects and Proposed Avoidance and Minimization Measures

Proposed Action Component	Impacted Jurisdictional Feature	Type of Feature	Potential Impacts to Federally Listed Species	Area	Proposed Mitigation (created:filled)
Runway 1R shift, EMAS, and Taxiway A Realignment	South Oxidation Pond[1]	Seasonal Wetland	None	2.41 ac (0.98 ha)	2:1 (Various wetland mitigation projects)
Runway 1R shift, EMAS, and Taxiway A Realignment	Bird Ball Ditch[1]	Other waters of the United States	None	0.36 ac (0.15 ha)	2:1 (Various wetland mitigation projects)
Runway 1R shift, EMAS, outfall pipes, and vehicle service road realignment	Tidal Marsh Southeast of Runway 1R[1]	Tidal Salt Marsh	California clapper rail	0.04 ac (0.02 ha)	5:1 (Deepwater Slough Island Wetland Mitigation Project) and Built-In Construction Mitigation measures
Runway 1R shift, EMAS, and vehicle service road realignment	Millbrae Highline Canal	Other waters of the United States	None	0.37 ac (0.15 ha)	2:1 (Various wetland mitigation projects)
RSA design standards for Runway 28R	Topographic Depression Between Runways 28L and 28R	Seasonal Wetland	None	0.54 ac (0.22 ha)	2:1 (Various wetland mitigation projects)
Approach light system and trestle structures	San Francisco Bay	Other waters of the United States	Various Federally Listed Fish	0.00 ac (0.00 ha)	Built-In Construction Mitigation measures
Proposed Action Total				3.72 ac (1.51 ha)	

Source: LSA Associates, Inc., 2011.

Notes:

See Section 6.0 of the Biological Assessment for discussion on effects of the Proposed Action and the associated mitigation.

[1] Previously verified by the USACE with no change in currently mapped jurisdictional boundary.

ac = acre/acres
EMAS = Engineered Materials Arresting System
ha = hectare/hectares
USACE = United States Army Corps of Engineers

Listed Fish Species/Essential Fish Habitat

To avoid construction activity during the migratory period (December 1 through June 14) of listed fish species in the SF Bay, pile installation activities related to modifications of the trestles that support the approach light systems at the approach ends of Runways 19L, 28L, and 28R would be conducted outside

of the migratory period to minimize potential effects to green sturgeon, longfin smelt, Chinook salmon, and/or steelhead. The Proposed Action Alternative would implement the avoidance and minimization measures described in **Section 4.8.6**. Given the implementation of these measures, the FAA determined that the project may affect, but is not likely to adversely affect, federally listed fish species, and initiated consultation with NMFS. The NMFS concurred with the FAA's determination for affects to listed fish species on November 3, 2011 (see **Appendix E3**).

The FAA has completed coordination with the NMFS concerning EFH. In an email to the FAA dated June 16, 2011, the NMFS identified that the following impacts that the proposed project would have on EFH:

1. *Noise from pile driving will be minimized by working at low tides when feasible and using an impact hammer. However, low frequency sound in the adjacent EFH waters may cause fish to leave the area temporarily.*

2. *Fill of 0.04 acre of tidal salt marsh and relocation and reconstruction of a seawall below high tide may adversely affect the function of EFH by simplifying shoreline habitat and modifying hydrology and nearshore sediment transport. Replacement of tidal marsh habitat with artificial structures will result in a permanent reduction of local productivity and reduce the value of this area as foraging habitat for EFH species.*

NMFS has determined that the proposed action would adversely affect EFH for various federally managed fish species within Pacific Groundfish, Pacific Salmon, and Coastal Pelagic Fishery Management Plans. However, avoidance and minimization measures are in place (as described in FAA's letter dated May 18, 2011) to reduce temporary impacts to EFH associated with pile driving, and mitigation is proposed to compensate for permanent impacts to tidal and seasonal wetlands. Therefore, NMFS did not provide any additional EFH Conservation Recommendations for the project.

California Clapper Rail

California clapper rails are known to occur in the tidal marsh along the southeastern edge of SFO and may attempt to breed there. Relocation of the VSR would result in the permanent loss of 0.04 acre of tidal marsh habitat, which is suitable for clapper rails. Although the area to be filled is considered marginal clapper rail habitat due to adjacent disturbance, low vegetation density and limited middle and high marsh zones, the conversion of a small portion of the existing tidal marsh to a paved service road slightly reduces the extent of available foraging, roosting, and nesting habitat for the local clapper rail population. The VSR and outfall replacement work is not expected to result in the destruction or disturbance of active clapper rail nests because this work would occur outside the clapper rail breeding season (February 1 through August 31). The USFWS issued a Biological Opinion on November 28, 2011 to address impacts to California clapper rail.

In addition to the permanent removal of clapper rail habitat for the VSR relocation, the Proposed Action Alternative may have temporary construction-related impacts on clapper rails through increased levels of disturbance. Increased levels of disturbance to clapper rails may result from noise, light and/or vibrations from equipment and construction activities in the marsh (i.e., during VSR relocation and outfall

replacement activities) and on the airfield. Operation of construction equipment in and adjacent to the marsh may result in displacement of clapper rails from protective cover and their territories. These disturbances may disrupt normal behavior patterns of breeding, foraging, sheltering, and dispersal, but such effects are expected to be short in duration and limited in frequency. Displaced clapper rails may have to compete for resources in occupied habitat and may be subject to increased predation, competition, mortality, and reduced reproductive success.

Implementation of the Proposed Action Alternative would result in approximately 10.0 acres of suitable clapper rail habitat southeast of Runway 1R being temporarily subject to disturbance by construction-related effects (i.e., noise, light and/or vibrations) associated with implementation of the Proposed Action Alternative. However, given the ongoing noise levels and disturbance associated with airfield operations, nearby traffic on Millbrae Avenue and U.S. 101, and use of the Bay Trail segment through Bayfront Park, it is expected that clapper rails occurring in the marsh are somewhat tolerant of moderate noise levels and disturbance. As such, implementation of the Proposed Action Alternative is not expected to appreciably contribute to the level of existing disturbance in the vicinity of the SFO RSA Program improvements. Measures to minimize disturbance-related impacts on clapper rails are outlined in **Section 4.8.5**.

Salt Marsh Harvest Mouse

The BA also evaluates whether the proposed project could affect the salt marsh harvest mouse *(Reithrodontomys raviventris raviventris).* The BA concluded the salt marsh harvest mouse is not present on the airport site. The closest known occurrence of this species was more than 50 years ago in an unnamed marsh between O'Neill Slough and the Bayshore Freeway in Foster City, more than 7 miles from SFO. The BA indicates salt marsh harvest mice are not expected to occur in the action area due to marginal habitat quality of the existing tidal marsh and lack of dense cover in upper marsh and adjacent upland. Therefore, the FAA has determined that the SFO RSA Program would have ***no effect*** on the salt marsh harvest mouse. The USFWS responded in its Biological Opinion dated November 28, 2011, that the proposed action would ***not likely adversely affect*** the salt marsh harvest mouse.

4.8.5 MITIGATION

4.8.5.1 Avoidance and Minimization Measures

The avoidance and minimization measures presented below have been incorporated into the Proposed Action Alternative to offset potential effects to listed species. Specifically, the proposed measures address: (1) potential effects to federal- and state-listed fish species due to pile driving activities associated with modifications to the wooden trestles in the SF Bay that support the approach light systems; and (2) potential effects to California clapper rail as a result of the VSR relocation and outfall pipe replacement work.

Listed Fish Species/Essential Fish Habitat

To avoid adverse effects on fish species protected under the Endangered Species Act and essential fish habitat for federally managed fish species, the CCSF will implement the avoidance and minimization measures

when installing new pilings in SF Bay associated with modifications to the trestles that support the approach light systems at the approach ends of Runways 28L, 28R, and 19L under the Proposed Action Alternative. These measures are based on the U.S. Army Corps of Engineers (USACE) *Proposed Procedures for Permitting Projects that will Not Adversely Affect Selected Listed Species in California*, dated November 16, 2006; programmatic consultation was completed with NMFS and USFWS on February 14, 2007.

1. All pile installation activities associated with the modifications to the in-Bay trestle structures that support the approach light systems will occur between June 15 and November 30 to avoid time periods when federally protected fish species have the greatest potential to occur in the vicinity of SFO.

2. All piles will consist of 20-inch-diameter timber that is chemically treated and wrapped with an impact-resistant, biologically inert material. All piles will be driven with an impact hammer.

3. Prior to construction, silt curtains will be installed around the in-water work area to minimize potential sedimentation and turbidity resulting from pile driving. The silt curtains will extend from the water surface to the substrate.

4. All pile installation activities will be conducted during low tides (if feasible due to access considerations) when water levels are at their lowest to minimize potential noise-related effects to fish and other marine organisms and turbidity.

5. In areas of strong current, piles will be driven when such currents are reduced (i.e., centered around slack current) to minimize the number of fish exposed to adverse levels of underwater sound.

California Clapper Rail

To minimize adverse impacts on California clapper rail, the Proposed Action Alternative would include the following avoidance and minimization measures:

1. Any project activities for the VSR relocation and outfall pipe replacement work within the tidal marsh along the southeastern edge of Runway 1R will be conducted outside the clapper rail breeding season (February 1 through August 31, following recommendations in the 2006 USACE NLAA Programmatic). Construction in this area will be conducted from September 1 through January 31.

2. A qualified biological monitor will monitor all VSR relocation and outfall pipe replacement activities occurring in the tidal marsh. The biological monitor will have the authority to stop work if deemed necessary for any reason to protect California clapper rails.

3. Prior to the initiation of VSR relocation and outfall replacement work in the marsh, a qualified biologist familiar with clapper rail biology will meet with construction personnel to: (1) provide information on clapper rail identification, habitat, and behavior; (2) review project-specific measures implemented to minimize effects on clapper rails; and (3) summarize all required

protection measures to be implemented and complied with to ensure that California clapper rails and their habitat are not impacted by construction activities.

4. To prevent equipment and personnel from entering the marsh and potentially disturbing foraging or roosting clapper rails, the perimeter of the VSR relocation and outfall replacement work areas in the tidal marsh habitat will be staked and fenced with silt fencing. The fence will be installed under the guidance of a qualified biological monitor.

5. To avoid the loss of individual clapper rails, construction activities within or immediately adjacent to tidal marsh habitat for the VSR relocation and outfall pipe replacement work will not occur within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge) when the marsh plain is inundated. During extreme high tides, protective cover for clapper rails is limited and construction activities could prevent them from reaching available cover.

6. Hazardous materials most likely to be used during VSR relocation and outfall pipe replacement work include fuels, lubricants, and solvents. If any hazardous material is inadvertently discharged during construction, the discharge will be immediately controlled and cleaned up.

7. All vehicle and equipment staging and refueling areas will be located in uplands outside of the tidal marsh.

8. The VSR relocation and outfall pipe replacement work areas will be maintained in clean condition. All trash (e.g., food scraps, cans, bottles, containers, wrappers, cigarette butts, and other discarded items) will be placed in closed containers and properly disposed of off site.

9. After construction is completed, all stakes, temporary fencing, flagging, and other refuse generated by construction will be carefully and completely removed. No native vegetation (e.g., pickleweed) will be removed or disturbed during the final cleanup process.

4.8.5.2 Compensatory Mitigation

As described in detail in the BA in **Appendix E1**, to compensate for 0.04 acre of direct impacts on tidal marsh and associated California clapper rail habitat from the VSR relocation, as well as temporary construction-related effects from the outfall replacement work, CCSF will purchase (prior to construction) and apply 0.20 acre of agency-recognized constructed tidal wetland mitigation habitat from the Deepwater Slough Island Wetland Mitigation Project in Redwood City, California as in-kind mitigation. This acreage represents a mitigation ratio of 5:1 (created tidal wetland acreage: impacted acreage).

4.8.5.3 Biological Opinion Terms and Conditions

The USFWS provided its Biological Opinion for the proposed SFO RSA Program, dated November 28, 2011, to the FAA. The USFWS included the following three Reasonable and Prudent Measures in their Biological Opinion:

1. The project proponent shall implement the proposed action, including proposed conservation measures, as described in the *Description of the Proposed Action*, of this biological opinion, unless modified by terms and conditions contained in the biological opinion.

2. The project proponent shall minimize adverse effects to the California clapper rail.

3. The project proponent shall ensure their compliance with this biological opinion.

The November 28, 2011, Biological Opinion included the following terms and conditions to implement the first two Reasonable and Prudent measures:

1. The FAA shall minimize the potential for harm or harassment of the California clapper rail resulting from the proposed action by implementing the proposed action, including proposed conservation measures, as described in *Description of the Proposed Action* of this biological opinion, with the inclusion of or modifications by the following terms and conditions of the biological opinion for the proposed action.

2. The FAA shall include Special Provisions that incorporate the Proposed Conservation Measures and the Terms and Conditions of this biological opinion in the solicitation for bid information. In addition, the FAA shall inform all contractors and subcontractors involved in the proposed action about the requirements of this biological opinion.

3. The biologist(s) proposed by the FAA to conduct environmental awareness training for all contractor and subcontractor personnel prior to entry to the VSR relocation and outfall pipe replacement work areas shall be approved by the Service. The biologist(s) shall be experienced with and knowledgeable about California clapper rail. This training shall review sensitive biological resources (e.g., California clapper rail, jurisdictional wetlands) at the site and shall identify all protection measures to be implemented and complied with to ensure that these resources are not affected by work activities. New employees shall attend a training session prior to participation in work activities.

The following terms and conditions implement Reasonable and Prudent Measure 3:

1. If requested, before, during, or upon completion of any work activities in the action area, the FAA shall coordinate, through appropriate SFO airfield staff, to allow for access by Service personnel to the work areas to inspect effects of the proposed action to the California clapper rail and its habitat.

2. The FAA shall submit a post-project compliance report prepared by a Service-approved biologist(s) to the Service's Sacramento Fish and Wildlife Office within sixty (60) calendar days following completion of the VSR relocation and outfall pipe replacement work or within sixty (60) calendar days of any break in work activities lasting more than sixty (60) calendar days. This report shall detail:

   i. dates that construction occurred;
   ii. pertinent information concerning the success of the proposed action in meeting the Proposed Conservation Measures and Terms and Conditions of this biological opinion;
   iii. an explanation of any failure to meet such measures;

iv. known project effects on the California clapper rail, if any;
v. occurrences of incidental take of this listed species;
vi. documentation of employee environmental awareness training; and
vii. other pertinent information. The reports shall be addressed to the Deputy Field Supervisor of the Endangered Species Program in the Service's Sacramento Fish and Wildlife Office.

3. The FAA shall comply with all reporting requirements in this biological opinion. The FAA will require the CCSF implement the measures identified in the USFWS Endangered Species Act, Section 7 consultation through AIP grant assurances or similar requirements to ensure that these measures are implemented. With implementation of these measures, the proposed action's impacts on the California clapper rail would be less than significant.

4.9 WETLANDS

4.9.1 OVERVIEW OF IMPACTS

Under the No Action Alternative, the Airport would continue to operate under its existing runway layout and no improvements beyond those needed for security, maintenance, and safety reasons would be implemented. No impacts on existing wetlands would be expected.

The Proposed Action Alternative would result in the fill of 3.72 acres of jurisdictional wetlands and other waters of the United States, consisting of 0.73 acre of other waters (Bird Ball Ditch and Millbrae Highline Canal), 2.95 acres of seasonal wetland (South Oxidation Pond and depression adjacent to Runway 28R), and 0.04 acre of tidal marsh. Other than the small amount of fill in the tidal marsh, the majority of project wetland impacts (3.68 acres) would affect low-value, constructed and maintained features that are part of the stormwater management system for the airfield and urban areas to the west.

4.9.2 METHODOLOGY

The Proposed Action Alternative would result in the complete fill of South Oxidation Pond, Bird Ball Ditch, and seasonal wetland between Runways 28L and 28R. Impacts on the tidal marsh were calculated by superimposing a conceptual VSR drawing on top of an aerial photo depicting the tidal marsh wetland boundary (i.e., 5.0-foot elevation contour) using Geographic Information Systems.

4.9.2.1 Thresholds of Significance

FAA Order 1050.1E, Appendix A, Section 18.3 indicates that a significant impact would occur to wetlands when a proposed action would do any of the following:

- Adversely affect a wetland's function to protect the quality or quantity of a municipal water supply, including sole source aquifers and a potable water aquifer.

- Substantially alter the hydrology needed to sustain the wetland's values and functions or those of a wetland to which it is connected.

- Substantially reduce the affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety, or welfare. The last term includes cultural, recreational, and scientific public resources or property.
- Adversely affect the maintenance of natural systems supporting wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands.
- Promote development of secondary activities or services that causes any of the above impacts.
- Be inconsistent with applicable state wetland strategies.

4.9.3 Operational Impacts

4.9.3.1 No Action Alternative

Under the No Action Alternative, the Airport would continue to operate under its existing runway layout and no improvements beyond those needed for security, maintenance, and safety reasons would be implemented. Impacts to existing wetlands would not occur.

4.9.3.2 Proposed Action Alternative

Once the Proposed Action Alternative is completed, there would be no further impacts on seasonal wetland communities on the airfield, nor to the tidal marsh along the southeastern edge of the airfield.

4.9.4 Construction Impacts

The proposed realignment of Taxiways A and A1, installation of EMAS beds, and construction of a new stormwater detention pond and pump at the southern end of Runways 1L and 1R would require filling of South Oxidation Pond (2.41 acres of jurisdictional wetlands) and Bird Ball Ditch (0.36 acre other waters), and construction of a box culvert over Millbrae Highline Canal (0.37 acre other waters) (see **Figure 4.9-1**).

As a result of the Proposed Action Alternative, the existing VSR, aircraft blast fence, an electrical substation, and the Airfield Operations Area security fence would have to be relocated to maintain the minimal safety distance outside the taxiway object-free area according to FAA design standards. An approximately 250-foot segment of the 20-foot-wide relocated VSR would directly impact 0.04 acre of existing tidal marsh. This impact is the minimum necessary to construct the VSR within the available space for the reconfigured RSA. The proposed VSR alignment will be as close to Runway 1R-19L as possible consistent with FAA Airport Design Standards. Complete avoidance of the marsh was not possible because the amount of space available for the Proposed Action Alternative in this portion of the airfield is limited (see **Figure 4.9-2**).

Proposed drainage improvements near the end of Runway 28R would require filling the 0.54-acre seasonal wetland/ponding area to comply with FAA AC 150/5300-13, *Airport Design*, which requires that RSAs be graded, level, and free of obstructions, including areas that retain water (see **Figure 4.9-3**).

LEGEND

- Non-jurisdictional Area
- Jurisdictional Area
- Tidal Marsh Jurisdictional Boundary
- Relocated Blast Fence
- Relocated Vehicle Service Road
- Engineered Materials Arresting System
- New Runway Pavement
- Relocated Taxiway
- Other New Asphalt Concrete
- Decommissioned Taxiway

Source:
Aerial Photo, SFO, June 2009.

N

0 250 500 FEET

PROPOSED ACTION IMPACTS ON JURISDICTIONAL AREAS RUNWAYS 1L AND 1R

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 4.9-1

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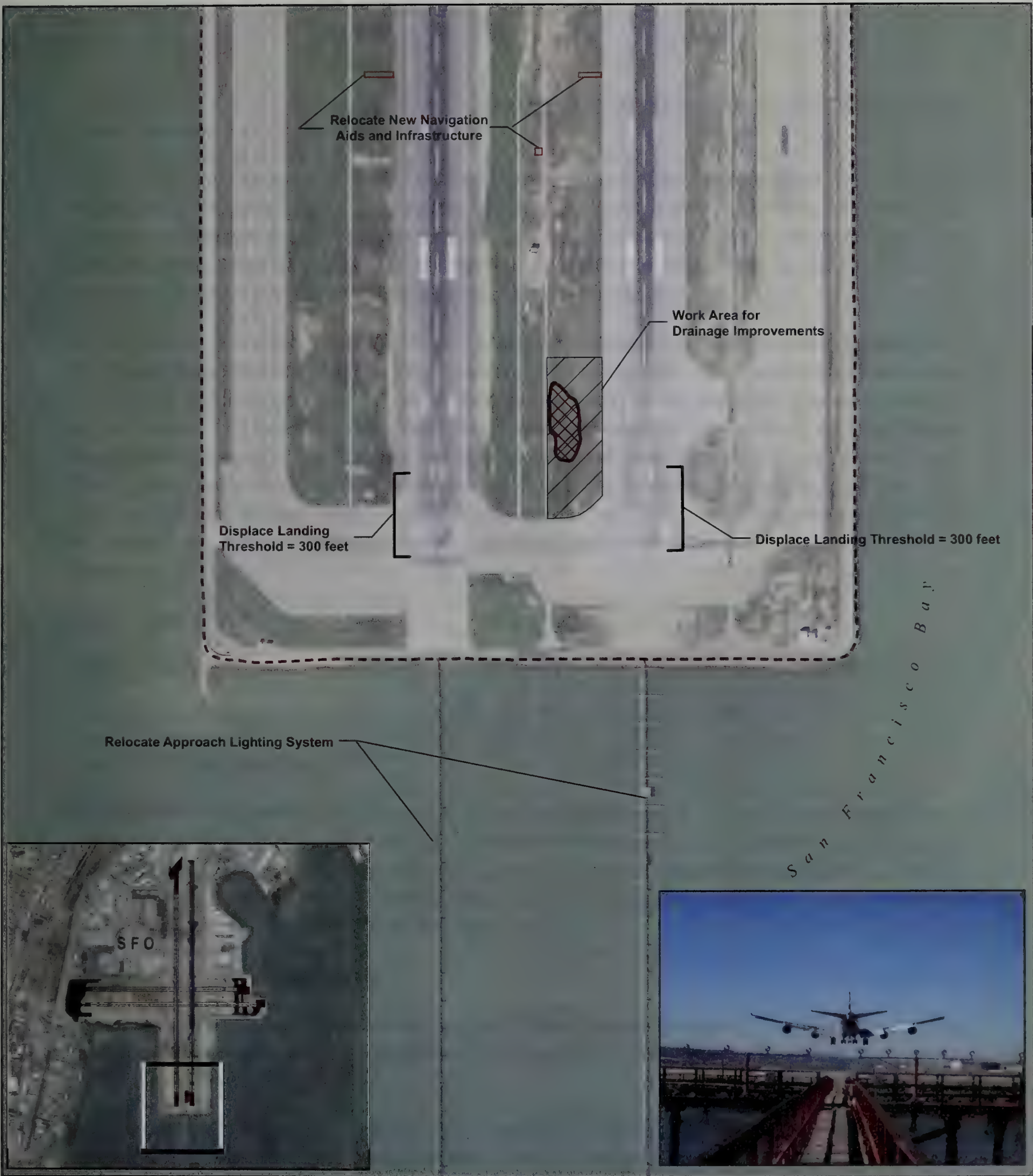
PROPOSED VEHICLE SERVICE ROAD RELOCATION AND OUTFALL REPLACEMENT WORK IMPACTS

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 4.9-2



LEGEND

- - - High Tide Line

Seasonal Wetland/Ponding Area to be Filled to Meet Runway Safety Area Requirements

Sources:
Aerial Photo, USGS, 2009; Inset Photo, D. Kessler, Federal Aviation Administration, 2010.

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0 250 500 FEET

PROPOSED ACTION IMPACTS ON JURISDICTIONAL AREAS RUNWAYS 28L AND 28R

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 4.9-3

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4.9.5 MITIGATION

CCSF would purchase (prior to construction) and apply 0.20 acre of agency-recognized constructed tidal wetland mitigation habitat from the Deepwater Slough Island Wetland Mitigation Project in Redwood City, California as in-kind mitigation to compensate for 0.04 acre of direct and indirect impacts on tidal marsh and associated California clapper rail habitat from the VSR relocation. This acreage represents a mitigation ratio of 5:1 (created tidal wetland acreage:impacted acreage).

CCSF plans to compensate for the remainder of jurisdictional impacts (3.68 acres) at a mitigation ratio of 2:1, which represents a target compensation acreage of 7.4 acres. SFO has entered into a Memorandum of Understanding with the Presidio Trust to fund the following wetland mitigation projects to meet the target acreage: (1) Quartermaster Reach (approximately 5 acres of new habitat); (2) YMCA Reach (approximately 2 acres of new habitat); and (3) Mountain Lake (approximately 0.5 acre of new habitat). Other options include the purchase of credits from an agency-approved wetland mitigation bank (e.g., San Francisco Bay Wetland Mitigation Bank in Redwood Shores). The overall mitigation program would be finalized by SFO and approved by the agencies prior to construction of the Proposed Action Alternative.

4.9.6 PERMITS

Permits necessary for implementation of the Proposed Action Alternative are listed in **Table 2-3**.

4.10 FLOODPLAINS

4.10.1 OVERVIEW OF IMPACTS

The No Action Alternative would not result in impacts on floodplains. A portion of the Proposed Action Alternative is within a 100-year floodplain. Within the 100-year floodplain, grading and paving is anticipated as part of the SFO RSA Program, but would not result in additional encroachment into the floodplain of San Francisco Bay. Potential impacts are not expected to result in significant adverse impacts on natural and beneficial floodplain values.

4.10.2 THRESHOLDS OF SIGNIFICANCE

The following orders were reviewed to analyze the Proposed Action Alternative: Executive Order 11988, Floodplain Management, and U.S. Department of Transportation Order 5650.2, *"Floodplain Management and Protection," April 23, 1979.*

Under these orders, the analysis considered any risk to, or resulting from, the No Action Alternative and Proposed Action Alternative, the impacts on natural and beneficial floodplain values, the degree to which the No Action Alternative and Proposed Action Alternative provide direct or indirect support for development in the floodplain, and measures to minimize harm or to restore or preserve natural and beneficial floodplain values.

To evaluate potential impacts, conceptual-level plans for the Proposed Action Alternative were reviewed and compared with floodplain information obtained from the available Flood Insurance Rate Map. In addition, available studies and documents related to sea-level rise predictions were reviewed.

FAA Order 1050.1E, Appendix A, Section 9 describes that floodplain impacts would be significant if a proposed action results in "notable adverse impacts on natural and beneficial floodplain values." The order identifies a "significant encroachment" of floodplains as one that causes:

- A high probability of loss of human life;
- Substantial encroachment-associated costs or damage (including interrupting aircraft service or loss of a vital transportation facility); or
- Adverse impacts on natural and beneficial floodplain values.

If a potential impact is considered significant, a finding would be required to confirm that no practicable alternative exists to placing the project in a floodplain, and that all measures to minimize harm would be included in the project.

4.10.3 Operational Impacts

4.10.3.1 No Action Alternative

Under the No Action Alternative, portions of the APE would continue to be within the 100-year floodplain. RSA-related improvements would not occur under the No Action Alternative; therefore, this alternative would not result in impacts on floodplains.

4.10.3.2 Proposed Action Alternative

Based on the 1984 Federal Emergency Management Agency (FEMA) map, approximately half of SFO is within the 100-year floodplain (FEMA, 1984a, 1984b, and 1984c). The Proposed Action Alternative includes the relocation and resizing of an existing stormwater detention basin, relocation of storm drainage features, relocation of an electrical substation, grading, paving, and EMAS installation. Within the FEMA-defined 100-year floodplain, the Proposed Action Alternative includes grading, paving, and installation of EMAS. The Proposed Action Alternative would be constructed at approximately the same elevation as the existing runway elevation. No new aboveground structures would be constructed within the 100-year floodplain.

The Proposed Action Alternative would not introduce any substantial changes to the ground surface elevation. No substantial above-grade structures would be constructed within the 100-year floodplain and therefore, the Proposed Action Alternative is not expected to impede or redirect flood flows. The Proposed Action Alternative would comply with federal, state, and local floodplain management regulations and would therefore minimize impacts on floodplains.

Because the work within the floodplain would be limited to grading, paving, and EMAS installation, substantial encroachment-associated costs or damage, interruptions to aircraft service, or loss of a vital transportation facility would not result from the Proposed Action Alternative. Other actions outside of the floodplain, such as relocation of an electrical substation and the relocation of and improvements to the

storm drainage system, would not impact the 100-year floodplain. Additionally, flood volume storage and infiltration would not be substantially altered because grades would remain approximately the same and the increases in impervious area would be small relative to the size of the floodplain. The Proposed Action would not result in any encroachment to floodplains.

4.10.4 CONSTRUCTION IMPACTS

Construction would occur within the 100-year floodplain. However, construction activities would be temporary and would not impact the base flood elevation, for the same reasons as described in **Section 4.10.3**, Operational Impacts.

4.11 COASTAL RESOURCES

4.11.1 OVERVIEW OF IMPACTS

The No Action Alternative would not result in changes to existing conditions at the Airport, and therefore would not result in direct or indirect impacts on coastal resources. The majority of the improvements associated with the Proposed Action Alternative are not within the 100-foot BCDC shoreline jurisdictional area (BCDC, 2011). Some improvements would be within the BCDC jurisdictional area and are expected to require permitting with BCDC. These improvements are expected to be consistent with applicable San Francisco Bay Plan (Bay Plan [BCDC, 2008]) policies and would not result in adverse impacts on coastal resources. Consultation with BCDC is discussed in **Chapter 5** and associated documentation is included in **Appendix F**.

4.11.2 THRESHOLDS OF SIGNIFICANCE

The FAA has not established thresholds of significance for impacts on coastal resources. However, for the purposes of this analysis, a proposed action would have potential for significant coastal zone impacts if it would have an adverse effect on coastal zone resources, or would be inconsistent with an approved coastal zone management program. The applicable approved coastal zone management program for SFO is the Bay Plan (BCDC, 2008).

4.11.3 OPERATIONAL IMPACTS

4.11.3.1 No Action Alternative

Under the No Action Alternative, the use of the coastal zone would not change as a result of the SFO RSA Program, and coastal resource impacts would not occur.

4.11.3.2 Proposed Action Alternative

Implementation of the Proposed Action Alternative would not increase aircraft operations or significantly change existing activities at the Airport. The Proposed Action Alternative would not introduce new activities or new pollutants, as described in **Section 4.7**, Water Resources.

Public access would not change as a result of implementation of the Proposed Action Alternative or interfere with future construction of the Bay Trail, which is planned to extend inland, generally west of the Airport and parallel to the Bay Area Rapid Transit and Caltrain corridors. For safety and security reasons, public access is not currently permitted through the BCDC shoreline jurisdictional area on airport property.

Operations-related environmental impacts associated with the Proposed Action Alternative would not be significant; therefore, no coastal resources impacts are anticipated.

4.11.4 Construction Impacts

Several elements of the Proposed Action Alternative would be constructed within BCDC jurisdictional areas, specifically the following elements:

- Runways 1L-19R and 1R-19L (North End): EMAS; new asphalt concrete; and relocated approach lighting system, which requires installation of 20 new 20-inch-diameter timber pilings on the existing trestle structures in San Francisco Bay;
- Runways 1L-19R and 1R-19L (South End): Modifications to the existing seawall for the relocated vehicle service road, which would require filling 0.04 acre of tidal marsh; new asphalt concrete; and a portion of the relocated stormwater detention pond, pumps, and outfalls; and
- Runways 10L-28R and 10R-28L (East End): Relocated approach lighting system which requires installation of ten new 20-inch-diameter timber pilings in SF Bay.

The Bay Plan designates SFO as an Airport Priority Use Area, which allows for BCDC approval of shoreline development and filling permits in accordance with standards for the use of the shoreline. Bay filling includes placement of pilings and moored floating structures for extended periods of time. The Proposed Action Alternative would require a minor amount of SF Bay fill related to the realignment of an existing sheet pile seawall and the existing trestles supporting the approach lighting system. This is consistent with Bay Plan policies relating to fill, because it would provide for the minimum filling necessary to achieve the project purpose. As described in **Section 4.8**, Fish, Wildlife, and Plants and **Section 4.9**, Wetlands, modifications to the existing seawall would result in potential direct impacts on tidal marsh and California clapper rail habitat. These impacts would be avoided, minimized, and compensated for, by implementation of mitigation measures, including compensation for 0.04 acre of direct impacts on tidal marsh and associated California clapper rail habitat.

The Proposed Action Alternative would be constructed in compliance with applicable water quality requirements and a SWPPP, which would identify construction BMPs to minimize water quality impacts on San Francisco Bay as described in **Section 4.7**, Water Resources.

As described in **Section 4.13**, Light Emissions and Visual Impacts, the SFO RSA Program improvements would be constructed at approximately the same elevation as the existing runway elevation and would not significantly alter existing views of the Airport.

Construction activities would not disrupt public access along the shoreline, including the existing Bay Trail, which is located south of the Airport along Bayshore Highway and north of the Airport along San Bruno Avenue.

Because potential construction-related environmental impacts from the Proposed Action Alternative would not be significant and are expected to be consistent with the policies in the Bay Plan, no significant impacts on coastal resources are anticipated.

4.12 HISTORIC, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

4.12.1 OVERVIEW OF IMPACTS

During the development of this EA, the FAA consulted with the State Historic Preservation Officer (SHPO) as part of the concurrent NEPA and Section 106 processes. In a letter dated February 1, 2011, the SHPO concurred with FAA's determination of the APE (see **Appendix F**).

There are no historic properties within the APE that are listed in or eligible for listing in the National Register of Historic Places (NRHP). As such, the Proposed Action Alternative would have no impact on archaeological resources upon project implementation or throughout the duration of the proposed undertaking. Similarly, the No Action Alternative would have no impact on archaeological resources.

No previously recorded historic architectural resources are within the APE and no new historic architectural resources identified as a result of the survey to appear to be eligible for listing in the NRHP. As such, the Proposed Action Alternative would not have adverse effects or significant impacts associated with any historic properties or historical resources. Similarly, the No Action Alternative would have no impact on historic architecture resources.

The FAA initiated Section 106 consultation with SHPO during the preparation of the EA, pursuant to 36 CFR Part 800. Pursuant to Title 36, CFR, Section 800.4, the FAA sought concurrence with the APE for the proposed undertaking from the California Historic Preservation Office. On February 1, 2011, the SHPO concurred that the FAA had adequately delineated the proposed project's APE. The FAA has also made a finding that the Proposed Action would not affect any listed or NRHP-eligible properties. In a letter dated August 26, 2011, SHPO concurred with the FAA's finding. Copies of SHPO's concurrence letters are included in **Appendix D1**.

4.12.2 THRESHOLDS OF SIGNIFICANCE

As a means to identify potential impacts to historic, architectural, archaeological, and cultural resources, a number of activities were undertaken, including a literature review and record search of materials on file at the Northwest Information Center; consultation with the Native American Heritage Council and the local Native American community; and field surveys for both archaeology and historic architectural resources. These cultural resources inventory efforts are further described in **Section 3.12**.

The four evaluation criteria to determine a resource's eligibility to the NRHP, in accordance with the regulations outlined in 36 CFR 800, are identified at 36 CFR 60.4. These evaluation criteria, listed below,

are used to help determine what properties should be considered for protection from destruction or impairment resulting from project-related activities (36 CFR 60.2).

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

(a) Resources that are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) Resources that are associated with the lives of persons significant in our past; or

(c) Resources that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) Resources that have yielded, or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

4.12.3 OPERATIONAL IMPACTS

4.12.3.1 No Action Alternative

Under the No Action Alternative, the proposed SFO RSA Program improvements would not be constructed. As such, no impacts on known historic, architectural, archaeological, or cultural resources would occur under the No Action Alternative.

4.12.3.2 Proposed Action Alternative

As discussed above, no NRHP resources that are listed, or eligible to be listed, have been identified within the SFO RSA APE. As such, the FAA has determined that no impacts on NRHP listed, or eligible to be listed, resources would occur with implementation of the Proposed Action Alternative. In a letter dated August 26, 2011, SHPO concurred with the FAA's determination (see **Appendix D1**).

4.12.4 CONSTRUCTION IMPACTS

As discussed above and in **Section 3.12**, no NRHP resources that are listed or eligible to be listed, have been identified within the APE. However, it is possible, though unlikely given the fact that the current undertaking is to be conducted on imported fill, that previously undiscovered archaeological resources may be exposed during construction activities. In the event of such an unanticipated discovery, these archaeological resources would need to be properly evaluated and managed in accordance with applicable federal, state, and local requirements; otherwise, significant impacts could occur. With appropriate consultation by a qualified archaeologist, any impacts on potentially eligible resources could be avoided, reduced, or mitigated (if necessary). In the event that previously unknown archaeological resources are encountered during construction, all ground-disturbing activities within 100 feet of the find will be temporarily suspended until the find can be evaluated by a qualified archaeologist. The development of mitigation measures, if needed, would be conducted in consultation with the FAA and

SHPO, and, if the site is of aboriginal association, the Native American Heritage Council and local Native American tribes. Impacts on historic, architectural, archaeological, and cultural resources would not occur with implementation of the Proposed Action Alternative, particularly through evaluation and management of any previously undiscovered archaeological resources in accordance with applicable federal, state, and local requirements. The FAA made a finding that the Proposed Action would not affect any listed or NRHP-eligible properties, and initiated Section 106 consultation with SHPO during the preparation of the EA. In a letter dated August 26, 2011, the SHPO concurred with the FAA's finding (see **Appendix D1**). The California SHPO recommended an archaeological monitor be present when working in fill predating the 1970s. The FAA believes the presence of an archaeological monitor during excavation of soil for the SFO RSA Program is appropriate. In the event that an artifact is discovered during earthmoving activities, work will be temporarily suspended in the immediate vicinity of the artifact so that the archaeological monitor may determine whether further investigation is necessary. If any human remains are discovered, the following procedures will be used:

1. In the event that suspected human remains are discovered, the archaeological field director or the Lead Environmental Inspector (LEI) will stop excavation immediately and notify their supervisors immediately. No bones or associated artifacts will be removed until further notice from these supervisors. A reasonable effort will be made to protect human remains from further damage or intrusion.

2. The supervisor(s) will direct that all ground disturbing activity within 100 feet of the find be stopped until notified in writing that work can recommence. The area of the remains will be clearly marked with flagging or safety fencing and guarded as needed.

3. The field supervisor(s) will immediately notify the FAA Project Manager and CCSF (during construction, restoration, and remediation). The LEI during construction also will be notified to oversee stop-work actions in the find area. The appropriate Project Manager and/or CCSF-designated Contractor in Charge (CIC) will direct the Archaeological Monitor to evaluate the find. The Archaeological Monitor will complete on-ground evaluation of the find within 24 hours of notification.

4. If the human remains are not obviously prehistoric in nature (e.g., in direct association with prehistoric artifacts), the Archaeological Monitor or LEI will report the burial to the San Francisco Police Department (SFPD) Dispatch office so the coroner or other officer can inspect the site and determine whether a criminal investigation is necessary.

5. The Archaeological Monitor or LEI will report the discovery to the FAA, and to CCSF's CIC. The CCSF will report to the discovery to the California SHPO (Mr. Tristan Tozer, Telephone [916] 445-7027) concurrently with notification of SFPD law enforcement officials.

   If the Archaeological Monitor cannot make a reasonable assessment of the discovery, then a physical anthropologist or bio-archaeologist will be called in to identify whether the remains could be of Native American or other ancestry. This may involve uncovering the skeleton if the necessary measurements cannot be taken in the field. It also may be necessary to expand the excavation to facilitate viewing the skeleton in situ and determine the context. Full excavation

and/or removal of the remains will not occur until the appropriate Native American representatives are notified and have had an opportunity to comment. Removal and reburial or other appropriate treatment options will be discussed with the appropriate Native American representatives. Any field methodology proposed will be conducted in consultation the California SHPO. Tables of skeletal attributes, and/or computer programs such as FORDISC, should be consulted to compare the skeletal measurements with existing human populations. If the measurements match those for Native American populations, or if there is doubt as to ancestry, they will be assumed to be Native American. Human remains found within prehistoric contexts will be assumed to be Native American, unless skeletal or site information strongly suggests otherwise.

6. For Native American remains, the FAA, in consultation with the California SHPO, will notify the designated Tribal monitor(s) as soon as a determination is made.

The FAA will require the CCSF implement the measures identified in consultation with the SHPO through AIP grant assurances or similar requirements to ensure that these measures are implemented. With implementation of these measures, the proposed action's impacts on historic properties would be less than significant.

4.13 LIGHT EMISSIONS AND VISUAL IMPACTS

4.13.1 OVERVIEW OF IMPACTS

The No Action Alternative would not result in light emission or visual impacts. The Proposed Action Alternative would involve minor modifications to existing airfield lighting and would involve night-time construction. However, no significant light emission impacts are expected. The potential effect on the visual landscape would be minimal with the implementation of the Proposed Action Alternative, because the SFO RSA Program improvements would be at-grade and within existing airport property.

4.13.2 METHODOLOGY

Light emission impacts associated with the No Action Alternative and the Proposed Action Alternative were determined by evaluating the extent to which airfield lighting would change, and the potential for the change to create an annoyance among people in the vicinity of the Airport. Evaluation of visual impacts considered the potential changes in landscape and views in the vicinity of the Airport.

4.13.2.1 Thresholds of Significance

Thresholds to determine the significance of lighting and impacts have not been established by the FAA due to the subjective nature of these impacts. For this EA, a light emission impact would occur when an action's light emissions create annoyance to or interfere with normal activities. Also for this EA, a visual impact would occur if an action would significantly contrast with the existing environment.

4.13.3 OPERATIONAL IMPACTS

4.13.3.1 No Action Alternative

The No Action Alternative does not involve changes to lighting or the visual character of the existing facilities at the Airport; therefore, there would be no light emissions or visual impacts.

4.13.3.2 Proposed Action Alternative

The Proposed Action Alternative would require the relocation of runway and taxiway lights and signage, relocation of approach lighting system mounted on trestles in the SF Bay, installation of runway status lights, relocation of an electrical substation, and modification to existing navigation aids on the airfield. In-pavement runway status lights would be installed concurrent with the RSA improvements. However, these modifications to the existing lighting system are all at-grade, and would not result in additional glare-inducing features. The lights would be situated on the runways and taxiways and would not create an annoyance among people in the vicinity or interfere with activities during the day or night. The Proposed Action Alternative would not increase the amount of nighttime lighting within the APE. There would be no significant light emission impacts as a result of the Proposed Action Alternative.

The Proposed Action Alternative components would be within the existing airfield and would not alter existing views of the Airport. There would be no significant contrast between the No Action Alternative and the Proposed Action Alternative visible from surrounding areas. Therefore, there would be no visual impacts as a result of the Proposed Action Alternative.

4.13.4 CONSTRUCTION IMPACTS

Temporary construction activities are anticipated to occur between 2012 and 2015; night-time lighting would be required for night-time construction activities. Construction lighting would be situated in the vicinity of existing runways and would be directed so that it would not introduce significant additional glare or create annoyance among people in the vicinity. Existing views of the Airport would not change significantly during construction as a result of the equipment used or temporary construction facilities or structures erected on the airfield. Therefore, there would be no significant light or visual emission construction impacts associated with the Proposed Action Alternative.

4.14 NATURAL RESOURCES AND ENERGY SUPPLY

4.14.1 OVERVIEW OF IMPACTS

Neither the No Action Alternative nor the Proposed Action Alternative would significantly impact natural resources that are unusual in nature or are in short supply. The Proposed Action Alternative would not increase aircraft operations or alter the use of the Airport when compared to the No Action Alternative. Therefore, the energy, fuel, and natural gas demands at SFO would not change with the implementation of the Proposed Action Alternative.

4.14.2 Thresholds of Significance

FAA Order 1050.1E does not identify specific impact thresholds for energy and natural resources. In accordance with U.S. Department of Energy and California Energy Commission criteria, as well as the goals, objectives, policies, and implementation measures/programs identified in the local jurisdictions' General Plans, natural resources and energy supply that appear to be affected were identified. For this EA, impacts on energy supply and natural resources would be considered significant if the implementation of the Proposed Action Alternative would:

- Require or result in construction of new electrical power or transmission facilities or expansion of existing facilities, which could cause significant environmental effects;
- Result in a statistically significant increase in fuel consumption caused by changes in aircraft or ground vehicle use;
- Encourage activities that result in the use of large amounts of fuel, water, or energy in a wasteful manner;
- Result in a substantial use of natural resources that are in short supply; or
- Not include facility improvements that promote renewable energy or consumption, where feasible.

4.14.3 Operational Impacts

4.14.3.1 No Action Alternative

Natural Resources

The No Action Alternative would not use or impact natural resources and minerals that are unusual in nature or are in short supply in the GSA.

Energy Supply

No changes would occur to increase or decrease the aviation activity at the Airport as a result of the No Action Alternative. The Airport would continue with the current forecast of aircraft operations, and therefore no additional fuel or energy consumption would occur. Therefore, fuel consumption is not anticipated to increase significantly.

4.14.3.2 Proposed Action Alternative

Natural Resources

Implementation of the Proposed Action Alternative would not use or impact natural resources and minerals that are unusual in nature or in short supply. The Proposed Action Alternative would also not result in any associated increase or decrease in aviation activity at the Airport.

Energy Supply

The Proposed Action would not induce activity, increase the number of aircraft operations, or alter the use of the Airport as compared to the No Action Alternative. Therefore, energy demands at SFO would not result in increases in use of electricity, gas, or fuel during operations.

4.14.4 CONSTRUCTION IMPACTS

Natural Resources

Construction of the Proposed Action Alternative would use common building materials such as asphalt and concrete for runways, taxiways, service roads, and soil for grading portions of the RSAs. These materials are considered widely available in the San Francisco Bay Area, and would not impact natural resources within the area. The EMAS blocks would be manufactured off site and would be transported to the Airport for installation.

Energy Supply

Fuel and energy would be used by construction vehicles and equipment during construction of the Proposed Action Alternative. However, it is not anticipated that the amount of energy and fuel needed to implement the Proposed Action Alternative would substantially impact supply, and BMPs would be implemented to ensure these resources are not used in a wasteful manner.

4.15 HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

4.15.1 OVERVIEW OF IMPACTS

Operational activities would not be altered, and ground disturbance or building alteration/demolition activities associated with construction would not occur under the No Action Alternative; therefore impacts to hazardous materials and solid waste are not anticipated. Construction of the Proposed Action Alternative would mostly involve shallow excavation and grading, except for deeper excavations for the electrical substation, pump station, and relocated seawall. Contaminated soil and groundwater may be encountered during some of these construction activities; however construction plans and specifications would include provisions for the handling, storage, treatment and/or testing and disposal of any contaminated materials. During construction fuel, oil, and other petroleum-based products would also be used and stored; however construction plans would include provisions for appropriate handling of these materials. The use of fuel, oil, and other petroleum-based products necessary for the routine operation of SFO would continue, and is not anticipated to increase as a result of implementation of the Proposed Action Alternative because aircraft operations would not increase. Implementation of BMPs in the form of avoidance and minimization measures would further reduce potential impacts.

4.15.2 THRESHOLDS OF SIGNIFICANCE

The locations of known, or potential, environmental contamination located at SFO or within 0.25 mile of the APE were identified and mapped (see **Figure 3.15-1**). This information was then compared to the areas that would be disturbed during construction of the Proposed Action Alternative. The potential for

impacts was further evaluated for the cases where the disturbance areas were located on, or adjacent to, areas where these substances and materials may be encountered. The types of hazardous materials, environmental contamination and/or other regulated substances potentially associated with implementation of the Proposed Action Alternative were also evaluated. This assessment was developed from what is known about existing land uses and facilities at the Airport, as well as the design and other construction requirements for the SFO RSA Program.

The findings of these evaluations were compared to appropriate regulatory guidelines, significance thresholds and other appropriate criteria. These include pertinent federal, state and local regulations as well as the thresholds of significance presented below.

FAA Order 1050.1E, Appendix A, Section 10 provides guidance on the framework for regulating hazardous materials and/or wastes. The need for additional information or analysis is required only if applicable federal, state, local, or tribal laws and regulations on hazardous or solid waste management are not expected to be met. Actions involving properties listed (or potentially listed) on the National Priorities List are considered significant by definition. Uncontaminated properties within a National Priorities List site's boundary do not always trigger this significance threshold.

4.15.3 Operational Impacts

4.15.3.1 No Action Alternative

Under the No Action Alternative, operational activities would not be altered, and no impacts to hazardous materials or solid waste would occur.

4.15.3.2 Proposed Action Alternative

Under the Proposed Action Alternative, operational activities would not be altered when compared to the No Action Alternative, and no impacts to hazardous materials or solid waste would occur.

4.15.4 Construction Impacts

4.15.4.1 No Action Alternative

No ground disturbance or building alteration/demolition activities would occur with the No Action Alternative. As such, the No Action Alternative would not generate additional solid wastes or disturb known or potential hazardous materials or waste sites. Adherence to current federal, state, and local policies would continue. Therefore, no impacts are anticipated.

4.15.4.2 Proposed Action Alternative

Construction activities associated with the Proposed Action Alternative would involve the use of hazardous materials in quantities that are typical of the construction industry. Construction would involve removal of existing surface material (i.e., concrete and asphalt) to prepare the new surface and relatively shallow excavations. Typical excavation depths for the Proposed Action Alternative would be approximately 2 to 4 feet. Other excavations for the seawall, electrical substation, and pump station

would range from 10 to 25 feet deep. Previous studies have indicated that depth to groundwater at SFO varies in the range of 0 to 17 feet below ground surface (SFO, 2006).

As discussed in **Section 3.14,** the exact locations are not available for the majority of past releases that may have impacted subsurface conditions; however these sites are generally located in the vicinity of the approach (western) ends of Runways 10L and 10R and the approach (southern) ends of Runways 1L and 1R. The majority of past releases have been petroleum hydrocarbons from Leaking Underground Storage Tanks and jet fuel releases from spills and below-grade pipelines. In the case of larger releases, soil or free product removal followed by routine groundwater monitoring events were conducted in order to study and/or reduce the potential threat of offsite migration and impacts.

Based on this analysis it is anticipated that potential construction impacts associated with the Proposed Action Alternative may include the handling of hazardous materials associated with construction and the possibility of encountering soil and/or groundwater contamination in select areas. These potential impacts would be minimized through the use of BMPs and compliance with applicable federal, state, and local regulations. The BMPs and requirements would include:

- The storage, labeling and disposal of hazardous materials in accordance with federal, state, and local regulations would be addressed in construction contract documents. Contractors would be held responsible for reporting any discharges of hazardous materials or other similar substances (in amounts above their reportable quantities). If threshold limits are exceeded for fuel storage, a spill prevention control and countermeasures plan may be required for the storage of flammable fuel hydrocarbons at the site.

- For any locations where environmental contamination could be encountered during the construction phase, the contractor's construction plans and specifications would include provisions for the handling, storage, treatment, and/or testing and disposal of contaminated soil, free product, and/or groundwater. These provisions may include the excavation and offsite disposal or potential testing and reuse of impacted soil on site beneath sealed surfaces.

- Contractor's demolition plans and specifications would include requirements for the testing, handling, removal and disposal of hazardous materials if demolition of any existing structures other than concrete and asphalt is proposed such as building materials that are known, or suspected, to have asbestos containing materials or lead-based paint.

- For locations requiring dewatering where environmental contamination could be encountered during the construction phase, the contractor would pre-arrange for dewatering water testing, storage, and treatment.

- A SWPPP would be required for construction activities as described in **Section 4.7**, which would include BMPs intended to eliminate or reduce the release of contaminants into the environment during wet weather conditions. These BMPs would include secondary containment and covered storage facilities requirements for aboveground/underground storage tanks; procedures and equipment for the clean-up of spills and accidental releases; training; auditing; and other work practices.

Debris associated with construction of the Proposed Action Alternative would be recycled wherever feasible in accordance with applicable laws, ordinances, and regulatory requirements, and SFO's construction recycling program. The volume of post-diversion demolition debris is not expected to be significant relative to existing annual disposal volumes and is not expected to result in significant impacts to solid waste.

4.16 CUMULATIVE IMPACTS

A cumulative impact is the environmental effect resulting from the incremental effects of a project when added to the effects of past, other present, and reasonably foreseeable future actions, regardless of the entity (i.e., federal or nonfederal) or person that would carry out those actions. In some cases, individually minor but collectively significant actions occurring over a defined period of time can cause cumulative impacts. The projects considered in the assessment of potential cumulative impacts for this EA are identified in **Section 3.15**.

4.16.1 METHODOLOGY

For this EA, 28 actions meet the criteria described in **Section 3.15**. The GSA was used to define the spatial boundary. As shown in **Table 3.15-1**, the timeframe ranges from 2005 through 2015. Because the cumulative projects within the vicinity of the Proposed Action Alternative are in various stages of planning and/or construction, it was not possible to fully quantify the impacts associated with them. Projects in the planning phase cannot provide enough data to ensure complete analysis. As such, a qualitative evaluation of the potential environmental impacts associated with these projects has been conducted. The analysis incorporates information and lessons learned from other studies and projects nationwide. Based on these other studies, the severity of potential impacts resulting from the cumulative projects was given a subjective ranking between 1 and 4. These rankings are as follows:

Ranking	Description
1	Environmental impacts would not occur to this resource category as a result of <u>either</u> the Proposed Action Alternative <u>or</u> the cumulative project.
2	Potential minor environmental impacts could occur to this resource category as a result of <u>either</u> the Proposed Action Alternative <u>or</u> the cumulative project; these projects would not result in a cumulative impact when added together.
3	Potential minor environmental impacts could occur as a result of <u>both</u> the Proposed Action Alternative and the cumulative project; the cumulative impact could be significant when these projects are added together.
4	Potential significant impacts could occur as a result of the Proposed Action Alternative <u>and</u> the cumulative projects, and the cumulative impact would be potentially significant.

Table 4.16-1 provides a summary of the impact analysis for the cumulative projects. When interpreting the ranking information in this table, consideration should be given to the fact that projects listed are primarily in the early development phase. As such, planners developing these projects have the opportunity and would likely incorporate design features to minimize and mitigate many of the potential impacts that have been identified.

4.16.2 Construction and Operational Impacts

A cumulative impact is the environmental effect resulting from the incremental effects of a proposed project when added to the effects of past, other present, and reasonably foreseeable future actions, regardless of the entity (i.e., federal or nonfederal) or person that would carry out those actions. In some cases, individually minor but collectively significant actions occurring over a defined period of time can cause cumulative impacts.

As indicated in **Table 4.16-1**, past, present, and reasonably foreseeable development projects in the spatial boundary have had impacts on, and have the potential to independently impact, a number of the resource categories evaluated in this EA. However, the Proposed Action Alternative is not projected to have significant impacts on any of these resource categories. The limited impacts of the Proposed Action Alternative would be mitigated through the implementation of proposed mitigation measures as discussed in other sections within this chapter of the EA. Thus, when considered in addition to other development projects, the Proposed Action Alternative is not expected to lead to significant cumulative impacts.

The projects considered in the assessment of potential cumulative impacts for this EA are identified in **Section 3.15**.

Past, present, and reasonably foreseeable development projects in the GSA have independently impacted, and have the potential to independently impact, a number of the resource categories evaluated in this EA, such as water quality, biotic communities, air quality, wetlands, and noise. However, the Proposed Action Alternative is not projected to have significant impacts on any of these resource categories. The limited impacts of the Proposed Action Alternative would be mitigated to the fullest extent practicable through the implementation of proposed mitigation measures, as discussed in other sections of this chapter of the EA. Thus, when considered in addition to other development projects identified in **Section 3.15**, the Proposed Action Alternative is not expected to result in significant cumulative impacts.

Table 4.16-1
Potential Cumulative Impacts

	Project Name	Air Quality	Coastal Resources	Compatible Land Use	DOT Section 4(f)	Fish, Wildlife, and Plants	Floodplains	Hazardous Materials, Pollution Prevention, and Solid Waste	Historic, Architectural, Archaeological, and Cultural	Light Emission and Visual	Natural Resources/Energy	Noise	Socioeconomics, Environmental Justice, and Children's Health	Water Resources	Wetlands
PAST (2005-2010)	Shoreline Protection and Security Project	2	2	1	2	3	2	2	2	2	2	2	1	2	2
	SFO Executive Airport Addition and New Hangar C	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	Runway 1-19L Overlay and Reconstruction	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	Runway 28R-10L Overlay and Reconstruction	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	Peninsula Medical Center Replacement (Notice of Determination September 2005)	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	Britannia East Grand	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	South City Lights	2	1	2	2	2	2	2	2	2	2	2	2	2	2
PRESENT (2011)	Terminal 2 Redevelopment	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	Hydrogen/Hythane Fueling Station	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	Water Transit Authority South San Francisco Ferry Terminal	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Millbrae Water Pollution Control Plant Flow Equalization	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	The Crossing, Parcels 3 and 4	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	249 East Grand Avenue, Office/Research and Development	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	Terrabay Phase II/III	2	1	2	2	2	2	2	2	2	2	2	2	2	2
FUTURE (2011-2015)	Airport Traffic Control Tower Relocation	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	Boarding Area E Renovation	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	Reconstruction of aircraft aprons at Boarding Areas C, E, F, G, and Plot 40	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	Terminal 1 Renovation and Boarding Area B	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	South McDonnell Road Realignment	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	Reclaimed Water System Project	2	1	1	2	2	2	2	2	2	2	2	1	2	2
	U.S. Highway 101/Broadway Interchange	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	San Bruno Caltrain Station Relocation	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	406 San Mateo Mixed-Use Project	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	Pacific Bay Vistas (former Treetop Apartments)	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	350 Beach Road (former Burlingame drive-in theater)	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	Britannia Point Grand Development	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	494 Forbes, Office/Research and Development	2	1	2	2	2	2	2	2	2	2	2	2	2	2
	Gateway Business Park	2	1	2	2	2	2	2	2	2	2	2	2	2	2

Notes:

1 No impacts would occur to this resource category as a result of <u>either</u> the Proposed Action Alternative <u>or</u> the cumulative project

2 Potential minor environmental impacts could occur to this resource category as a result of either the Proposed Action Alternative or the cumulative project; these projects would not result in a cumulative impact when added together.

3 Potential minor environmental impacts could occur as a result of both the Proposed Action Alternative and the cumulative project; the cumulative impact could be significant when these projects are added together.

4 Potential significant impacts could occur as a result of the Proposed Action Alternative and the cumulative projects, and the cumulative impact would be potentially significant.

DOT = U.S. Department of Transportation
SFO = San Francisco International Airport

CHAPTER 5.0
COORDINATION AND PUBLIC INVOLVEMENT

5.1 INTRODUCTION

Public involvement and agency coordination programs were implemented at the beginning of the preparation of this Environmental Assessment (EA) for the San Francisco International Airport (SFO or Airport) Runway Safety Area (RSA) Program to ensure that information was provided to the general public and regulatory agencies, and that input from these parties was received and considered as the draft EA was prepared. Under 40 Code of Federal Regulations (CFR) 1501.4, federal agencies are required to involve environmental agencies, applicants, and the public, to the extent practicable, in preparing EAs. Therefore, when conducting the National Environmental Policy Act (NEPA) process, the Federal Aviation Administration (FAA) and the airport sponsor are encouraged to begin early coordination with the proper federal, state, tribal, and local agencies, including surrounding municipalities, to determine any possible environmental concerns. Following release of the Draft EA document, a public hearing was held to receive input on the findings presented in the Draft EA. The primary components of the agency coordination and public involvement program for the EA include:

- Distribution of an early notification letter to agencies, local communities, and stakeholder groups;
- Meetings conducted by the FAA and SFO with federal, state, and local agencies, as well as with local communities;
- Creation of a project web site that the public and agencies can use to obtain information regarding the SFO RSA Program and the EA process;
- Publication of the Draft EA for agency and public review;
- A public workshop and Public Hearing; and
- Preparation of this Final EA, which includes responses to comments received on the Draft EA.

Keeping agencies and the public informed and gathering their input is an essential component of any environmental study. The following sections summarize the agency coordination and public involvement program for this EA.

5.2 EARLY NOTIFICATION

On October 25, 2010 an early notification letter was mailed to regulatory agencies, local communities, stakeholders, and interested members of the public. The notice summarized the project purpose and elements, along with the NEPA and California Environmental Quality Act document preparation and process. A copy of the early notification letter and the accompanying project description and project figures are included in **Appendix F1**. The list of parties to whom the early notification letter was distributed is also included in **Appendix F1**.

5.3 AGENCY AND COMMUNITY MEETINGS

A series of agency and community meetings was conducted by the FAA and SFO between October 13, 2010, and February 8, 2011, to explain the SFO RSA Program and solicit comments and questions from agencies and communities.

5.3.1 LOCAL COMMUNITY MEETINGS

On November 10, 2010, as part of the early notification process, SFO mailed notifications describing the Proposed Action Alternative under environmental review. These notifications were mailed to regulatory agencies and stakeholders, including cities and special interest groups. **Appendix F1** provides the mailing list and a sample neighborhood notice letter. From October to December 2010, SFO staff met with various regulatory agencies and adjacent cities to provide in-person briefings and to answer questions about the Proposed Action Alternative. The following meetings with local communities and stakeholders were conducted by SFO as part of the EA development process:

- City of San Bruno – November 8, 2010;
- City/County Association of Governments – San Mateo County and SFO/Community Roundtable – November 15, 2010;
- City of South San Francisco – November 17, 2010;
- City of Burlingame – November 17, 2010; and
- City of Millbrae – November 24, 2010 and December 1, 2010.

The attendees at these meetings are listed in the summary notes included in **Appendix F1**.

5.3.2 AGENCY MEETINGS

The following meetings were conducted by the FAA and SFO with federal, state, and local agencies as part of the EA development process:

- U.S. Army Corps of Engineers (USACE) Interagency Meeting – October 13, 2010;
- San Francisco Bay Development and Conservation Commission (BCDC) – November 8, 2010;
- U.S. Fish and Wildlife Service (USFWS) – January 20, 2011; and
- National Marine Fisheries Service (NMFS) and California Department of Fish and Game (CDFG) – February 8, 2011.

The attendees for the USACE Interagency Meeting and the BCDC meeting are listed in the summary notes included in **Appendix F1**. The agendas and attendance lists for the USACE Interagency Meeting, USFWS meeting, and the meeting with NMFS and CDFG are included in **Appendix F1**. A sample copy of the slide presentation used in the meetings is also included in **Appendix F1**.

5.3.3 PROJECT WEBSITE

A project website was established at http://www.sforsaprogram.org to provide background information and details on the SFO RSA Program. The project website is periodically updated to provide project documentation, including the Draft and Final EAs, and schedule information.

5.4 COMMENTS RECEIVED IN RESPONSE TO THE EARLY NOTIFICATION

The meeting summary provided in **Appendix F1** includes a summary of the questions and comments that have been received during the local community, stakeholder, and agency meetings. On December 3, 2010, the City of San Bruno Community Development Department submitted a letter requesting

assurance that the proposed project would not change the: 1) 14 CFR Part 77 surfaces; and 2) existing noise contours. A copy of the letter is provided in **Appendix F1**. **Section 3.2** of the Draft EA describes the existing condition (2010) aircraft noise contour; **Section 4.2** provides aircraft noise contours for future analysis years for the No Action and Proposed Action alternatives.

The following sections describe airport imaginary surfaces and discuss their applicability; and discuss potential changes to such surfaces under the Proposed Action Alternative compared to the No Action Alternative.

5.4.1 APPLICABILITY AND USE OF CIVIL AIRPORT IMAGINARY SURFACES

SFO has overlying volumes of airspace defined by Title 14: *Aeronautics and Space, Part 77—Safe Efficient Use and Preservation of Navigable Airspace*, which are called "imaginary surfaces" because they are invisible to the human eye. Imaginary surfaces described in Part 77, Section 77.19, *Civil airport imaginary surfaces*, are used to:

- Evaluate the effect of the construction or alteration on (aircraft) operating procedures;
- Determine the potential hazardous effect of the proposed construction or alteration on air navigation;
- Identify mitigating measures to enhance safe air navigation;
- Chart new manmade or natural objects; and
- Identify potential aeronautical hazards in advance, thus preventing or minimizing the adverse impacts to the safe and efficient use of navigable airspace.

With respect to the control of land uses near airports, these civil airport imaginary surfaces are used to identify whether a natural or manmade object is deemed to be an obstacle or an obstruction. If an object penetrates the 14 CFR Part 77 Surface, the FAA must determine if that object represents a hazard to air navigation. The FAA is solely responsible to complete an Aeronautical Study that provides a determination regarding the impact to air navigation. One of three FAA determinations is typically issued:

- No Objection;
- Conditional Determination; or
- Objectionable.

For the purpose of describing the resultant changes in the location and vertical heights of the overlying 14 CFR Part 77.19, *Civil airport imaginary surfaces*, that would be affected by the proposed extension of Runway 10R and shift of Runways 1L and 1R, the discussions of those respective height changes are limited to the assessment of approach surfaces only.

5.4.2 APPROACH SURFACES

One of the imaginary surfaces that would be affected when extending any runway at SFO is called the approach surface. It is one of the most critical of the civil airport imaginary surfaces because it is the one that the aircraft uses to make its approach to landing and is established to provide for the safe horizontal and vertical approach to the runway end. The geometric dimensions of each approach surface vary

based on the category of each runway and the type of approach available or planned for that runway. The approach surface is the vertical height that the FAA uses to determine obstructions to air navigation.

The approach surface is trapezoidal in shape, begins 200 feet before the physical end of the runway, slopes outward and upward away from the runway end, and provides obstacle avoidance protection to aircraft when using visual approach procedures, or nonprecision or precision instrument approach procedures. The slope of each approach surface varies depending on whether the approach to the runway end is by visual reference only, or by use of electronic navigation (e.g., precision instrument approach).

The visual approach surface is 5,000 feet in length and slopes outward and upward at a rate of 20:1, meaning that for each 20 feet the surface extends outward, the surface rises 1 foot vertically. Using visual approach procedures, pilots must land the aircraft relying only on visual references, without the aid of in-aircraft instruments or other electronic navigational aids. This type of approach is limited to clear weather conditions.

A nonprecision instrument approach surface is 10,000 feet in length and has a 34:1 slope. When supporting precision instrument approach procedures, the approach surface has two separate segments, each having different slopes. The inner segment has a length of 10,000 feet and a 50:1 slope. The outer segment has a length of 40,000 feet and a 40:1 slope. Using instrument approach procedures, pilots use a variety of on-board and external electronic navigation aids to provide horizontal and vertical guidance to the approach end of the runway. Instrument approach procedures are classified as providing either nonprecision instrument or precision instrument navigational capabilities.

Unique to the approach surfaces, specific pre-established vertical separation distances must be maintained between the overlying approach surface and the underlying roadways, interstate highways, or railroads. If penetrations cannot be avoided, the FAA may determine that penetrations of these surfaces can occur, but with mitigating actions.

All efforts should be made to keep natural or manmade objects below these surfaces. To the greatest extent possible, the approach surface should remain clear of all objects, so that nothing can impede the landing of an aircraft during the last segment of the landing, called the final approach.

5.4.3 CHANGE IN OVERLAYING APPROACH SURFACE HEIGHTS FOR RUNWAYS 10L, 10R, 1L, AND 1R

This section describes the resultant change in the overlying height of the 14 CFR Part 77, *Civil airport imaginary approach surfaces*, for Runways 10R, 1L, and 1R under the Proposed Action Alternative. The final approach surfaces are subject to refinement, pending completion of site surveys by certified surveyors and detailed aeronautical photography during subsequent detailed design. Therefore, the analysis of the Proposed Action Alternative provided below is preliminary, based on best available information at the publication of the Draft EA, and is subject to change.

Figures depicting the approach surfaces under the Proposed Action Alternative in both plan and profile views are provided for each (Runways 10L, 10R, 1L, and 1R). As with the approach surfaces, the elevations and surface profiles are preliminary and subject to change upon completion of site surveys.

Runway 10L-28R

Runway 10L, the western end of Runway 10L-28R, is served by a nonprecision instrument approach surface.[1] As shown on **Figure 5-1**, no changes will be made to this runway under the Proposed Action Alternative, and the height of the 34:1 nonprecision instrument approach surface for this runway will not change along any point of its 10,000-foot approach surface length.

Runway 10R-28L

Similar to Runway 10L, Runway 10R, the western end of Runway 10R-28L, is served by a nonprecision instrument approach surface and would be extended approximately 781 feet westward. If the runway end elevation remains the same under the Proposed Action Alternative at 5.9 feet mean sea level (MSL), the points below the 10,000-foot length of the 34:1 nonprecision instrument approach surface would be approximately 23 feet lower than under the No Action Alternative. **Figure 5-2** provides an approximate plan and profile view of both the Proposed Action and No Action alternatives for Runway 10R.

Runway 1L-19R

Under the No Action Alternative, Runway 1L, the southern end of Runway 1L-19R is served by a visual approach surface and has its current displaced threshold, 491 feet from the physical end of the runway. Under the Proposed Action Alternative, the runway would be shifted southward by approximately 450 feet, and the distance between the displaced threshold and the end of the Runway 1L would be reduced to 56 feet. If the runway end elevation remains unchanged at 10.3 feet MSL under the Proposed Action Alternative, points below the 5,000-foot length of the 20:1 visual approach surface would be approximately 22.5 feet lower than under the No Action Alternative. **Figure 5-3** provides an approximate plan and profile view of both the Proposed Action and No Action alternatives for Runway 1L.

Runway 1R-19L

Under the No Action Alternative, Runway 1R, the southern end of Runway 1R-19L, is served by a visual approach surface and has its current displaced threshold, 238 feet from the physical end of the runway. Under the Proposed Action Alternative, Runway 1R-19L would be shifted by approximately 200 feet southward. The distance between the displaced threshold and the end of the runway would be reduced to 98 feet. If the runway end elevation remains unchanged at 11.3 feet MSL under the Proposed Action Alternative, points below the 5,000-foot length of the 20:1 visual approach surface would be approximately 10.3 feet lower than under the No Action Alternative. **Figure 5-4** provides an approximate plan and profile view of both the Proposed Action and No Action alternatives for Runway 1R.

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1 A nonprecision instrument approach is a type of aircraft approach subject to instrument flight rules. A precision instrument provides both vertical and lateral guidance to the pilot. A nonprecision instrument approach provides only vertical guidance to the pilot and is characterized by an approach slope that is lower and more gradual (e.g., 34:1) than a precision approach slope (20:1).

5.5 DRAFT EA PUBLIC REVIEW

The Draft EA was made available for review by the general public, government agencies, and interested parties for a period of 35 days. The Notice of Availability (NOA) of the Draft EA for review was published on Friday, June 24, 2011. The public review and comment period on the document extended from June 24, 2011, through July 29, 2011. The NOA was sent to all those included on the mailing list provided in **Appendix F1**. The NOA was published in the San Francisco Chronicle, the San Jose Mercury News, and the San Mateo County Times, and posted to project website described in **Section 5.3.3** (see **Appendix F2**). Copies of the Draft EA were available for review at the locations listed below, which include the SFO Bureau of Planning and Environmental Affairs, FAA Western-Pacific Regional Office in Hawthorne, California, and the FAA Airport's District Office in Burlingame, California.

FAA Western-Pacific Region, Airports Division	15000 Aviation Boulevard	Hawthorne
FAA Western-Pacific Region, San Francisco Airports District Office	831 Mitten Road, Room 210	Burlingame
San Francisco International Airport, Bureau of Planning and Environmental Affairs	710 N. McDonnell Road, 3rd Floor	San Francisco
South San Francisco Main Library	840 West Orange Ave.	South San Francisco
San Bruno Library	701 Angus Avenue West	San Bruno
Millbrae Library	1 Library Avenue	Millbrae
Foster City Library	1000 East Hillsdale Boulevard	Foster City
Burlingame Public Library	480 Primrose Road	Burlingame
San Mateo Main Library	55 West 3rd Ave	San Mateo
Serramonte Main Library	40 Wembley Drive	Daly City
San Francisco Main Library	100 Larkin Street	San Francisco

Anyone wishing to comment on the Draft EA was offered the opportunity to do so in writing, or in person, at the public workshop and public hearing described in **Section 5.6**. The deadline for submitting the comments indicated in the NOA was by 5:00 p.m. Pacific Daylight Time (PDT), Friday, July 29, 2011. The NOA identified a contact person to receive comments, and provided the following contact information.

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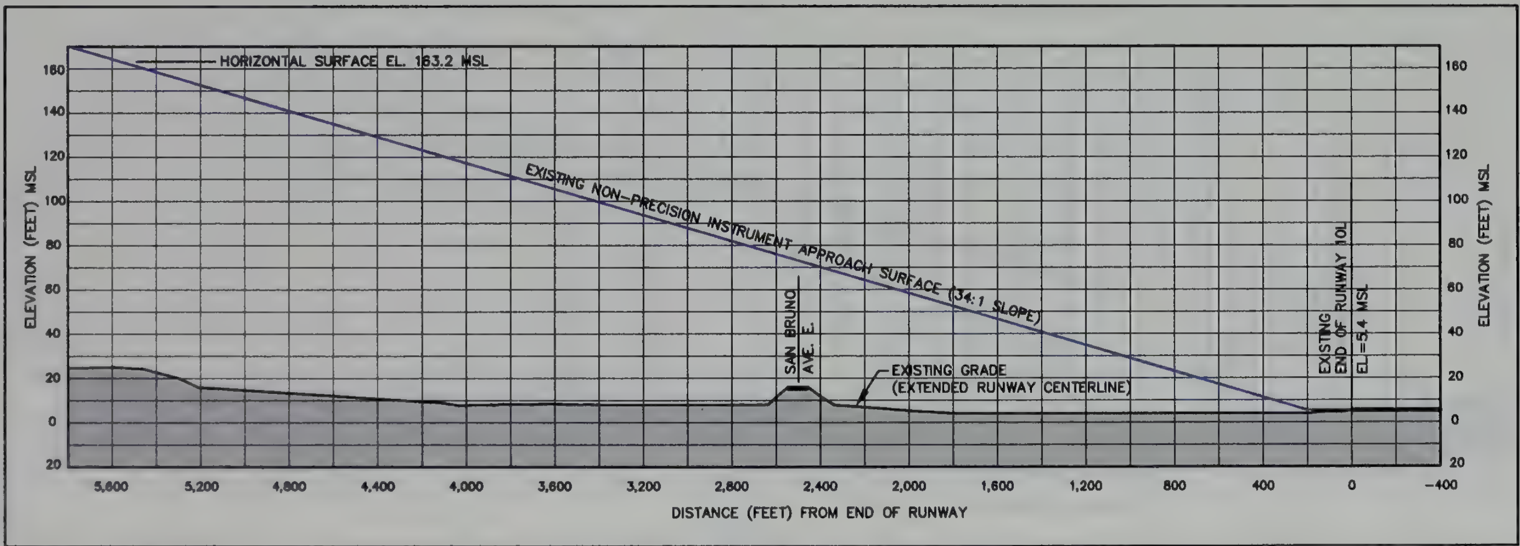
Bureau of Planning and Environmental Affairs
San Francisco International Airport
P.O. Box 8097
San Francisco, California 94128
Fax: (650) 821-5383

NOTE: SURFACES SHOWN ARE PRELIMINARY/DRAFT AND SUBJECT TO CHANGE BASED ON DETAILED DESIGN AND FEDERAL AVIATION ADMINISTRATION REVIEW.

PLAN VIEW



PROFILE VIEW

Source: SFO, 2011.

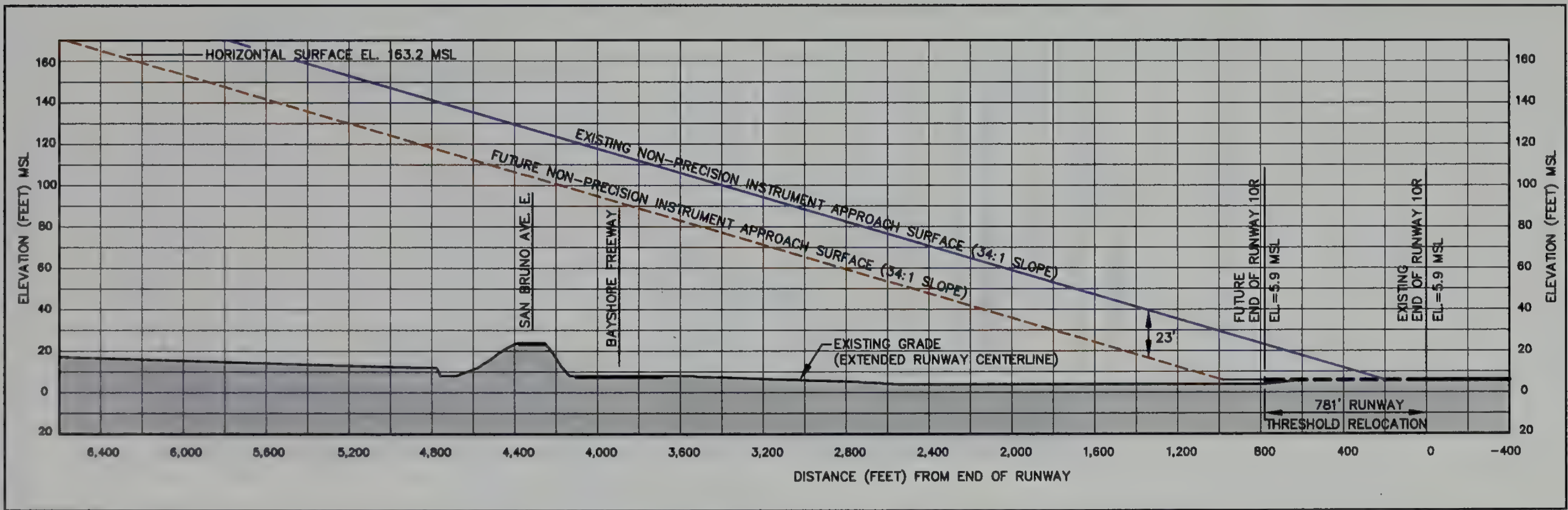
RUNWAY 10L APPROACH SURFACE

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

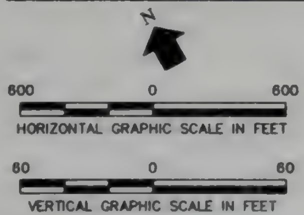
FIGURE 5-1

NOTE: SURFACES SHOWN ARE PRELIMINARY/DRAFT AND SUBJECT TO CHANGE BASED ON DETAILED DESIGN AND FEDERAL AVIATION ADMINISTRATION REVIEW.

PLAN VIEW



PROFILE VIEW

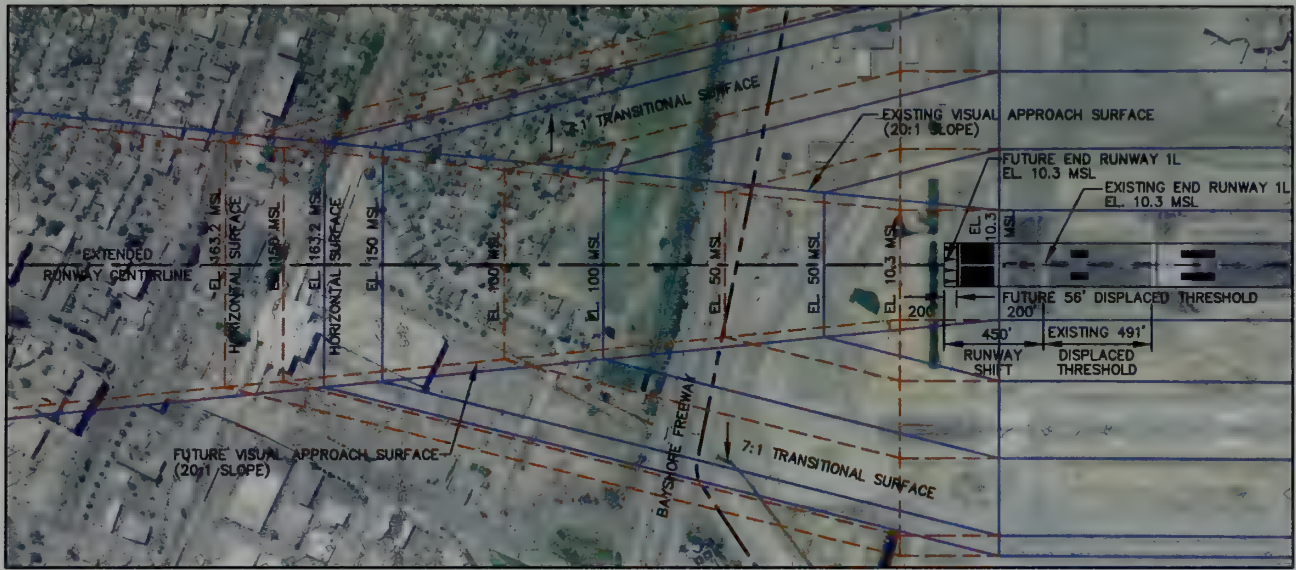


Source: SFO, 2011.

RUNWAY 10R APPROACH SURFACES

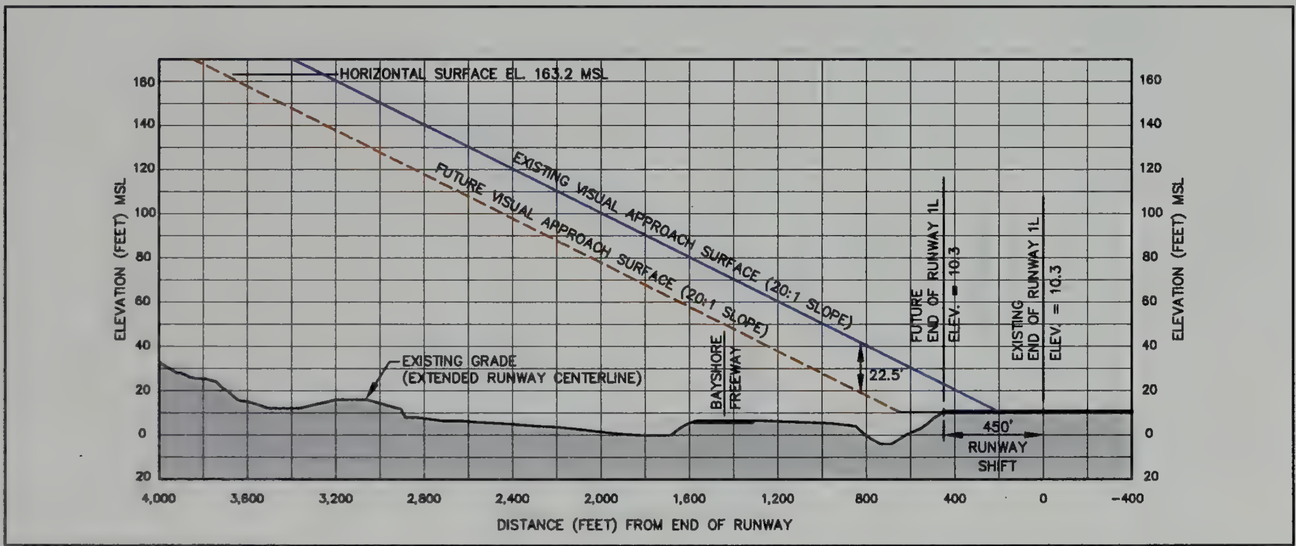
San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 5-2



PLAN VIEW

NOTE: SURFACES SHOWN ARE PRELIMINARY/DRAFT AND SUBJECT TO CHANGE BASED ON DETAILED DESIGN AND FEDERAL AVIATION ADMINISTRATION REVIEW.



PROFILE VIEW

600 0 600
HORIZONTAL GRAPHIC SCALE IN FEET

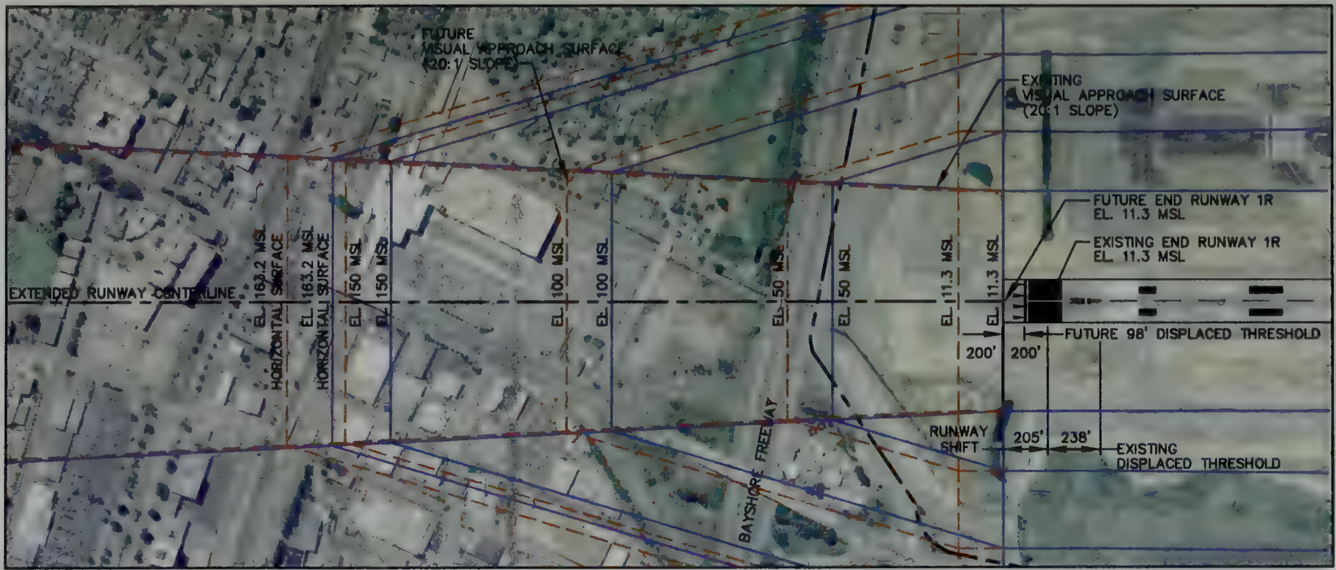
60 0 60
VERTICAL GRAPHIC SCALE IN FEET

Source: SFO, 2011.

RUNWAY 1L APPROACH SURFACES

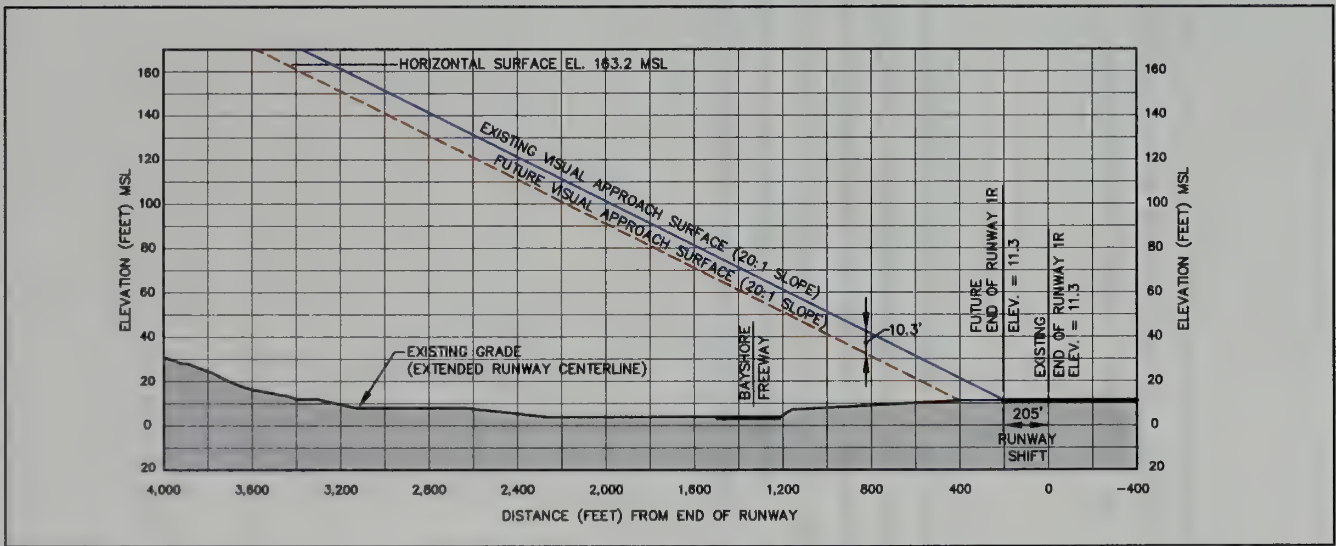
San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 5-3



PLAN VIEW

NOTE: SURFACES SHOWN ARE PRELIMINARY/DRAFT AND SUBJECT TO CHANGE BASED ON DETAILED DESIGN AND FEDERAL AVIATION ADMINISTRATION REVIEW.



PROFILE VIEW

600 0 600
HORIZONTAL GRAPHIC SCALE IN FEET

60 0 60
VERTICAL GRAPHIC SCALE IN FEET

Source: SFO, 2011.

RUNWAY 1R APPROACH SURFACES

San Francisco International Airport
Runway Safety Area Program Final EA
San Francisco, California

FIGURE 5-4

All comments received on the Draft EA were considered by the SFO and FAA in preparing this Final EA. SFO and FAA did not receive any comments during the 10-day period after the public hearing, consistent with FAA Order 5050.4B, SFO and FAA would have considered reasonable comments submitted after the public hearing until the time of completion of the Final EA.

5.6 PUBLIC WORKSHOP AND PUBLIC HEARING

A public hearing to receive comments from the public, agencies, and other interested parties on the Draft EA was conducted from 7:30 p.m. to 9:00 p.m. PDT on Thursday, July 28, 2011 at the location listed below. No verbal comments were received at the public hearing.

Millbrae City Hall (Chetcuti Room)
450 Poplar Avenue
Millbrae, California 94030

A public workshop was also held from 6:30 p.m. to 7:30 p.m. PDT on the same day and at the same location as the public hearing, to provide an opportunity for the public to ask any questions about the Proposed Action. Copies of the sign-in sheet and the public hearing transcript are included in **Appendix F2**.

5.7 FINAL EA

In development of the Final EA, SFO and the FAA considered comments received within the comment period. One letter was received during the comment period, and one comment card was submitted at the public hearing. Copies of these written comments and responses are included in **Appendix F2**. The written comments did not require any revisions to the EA. Changes incorporated into this Final EA include minor editorial corrections and clarifications, as well as updates to **Chapters 3, 4**, and **5**, and **Appendices D, E**, and **F** to document the agency consultation process and the public involvement activities completed after release of the Draft EA.

CHAPTER 6.0
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CHAPTER 8.0
LIST OF ABBREVIATIONS AND ACRONYMS

The following is a list of acronyms that are used in the Environmental Assessment (EA).

A

AAM	Annual Arithmetic Mean
ABAG	Association of Bay Area Governments
ac	acre/acres
AC	Advisory Circular
ACCRI	Aviation Climate Change Research Initiative
ACRP	Airport Cooperative Research Programs
ADG	Airplane Design Group
AIP	Airport Improvement Program
Airport	San Francisco International Airport
ALUC	Airport Land Use Commission
AOA	airport operations area
APE	Area of Potential Effect
ARC	Airport Reference Code
ASDA	Accelerate-Stop Distance Available
AST	aboveground storage tank
ATCT	Airport Traffic Control Tower

B

BA	Biological Assessment
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit
Bay Plan	San Francisco Bay Plan
BCDC	Bay Conservation and Development Commission
BMP	best management practice

C

CA FID UST	California Facility Inventory Database Underground Storage Tank List
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal Recycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCSF	City and County of San Francisco
CDFG	California Department of Fish and Game
CDOC	California Department of Conservation
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CERC-NFRAP	Comprehensive Environmental Response, Compensation and Liability Act No Further Action Required
CFR	Code of Federal Regulations
CHMIRS	California Hazardous Material Incident Reporting System
CIC	Contractor in Charge
CLUP	Compatible Land Use Plan
CNEL	Community Noise Equivalent Level
CNG	compressed natural gas
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CPR	cardiopulmonary resuscitation
CRHR	California Register of Historical Resources
CT	census tract
CUPA	Certified Unified Program Agency

D

dB	decibel
dBA	A-weighted decibel
DOT	U.S. Department of Transportation
DPS	distinct population segment
DTSC	Department of Toxic Substances Control
DWR	California Department of Water Resources

E

EA	Environmental Assessment

EDR	Environmental Data Resources, Inc.
EFH	Essential Fish Habitat
EIR	Environmental Impact Report
EMAS	Engineered Materials Arresting System
ERNS	Emergency Response Notification System
ESA	Endangered Species Act
ESA	Environmental Science Associates
ESU	Evolutionary Significant Unit

F

FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FMP	Fishery Management Plan
FR	Federal Register

G

GAO	General Accounting Office
GHG	greenhouse gas
GIS	Geographic Information Systems
GSA	Generalized Study Area
GSE	ground support equipment

H

H_2O	water vapor
Ha	hectare/hectares
HIST UST	Historical Underground Storage Tank List
HNTB	HNTB Corporation

I

I-380	Interstate 380
ICIS	International Construction Information Society
INM	Integrated Noise Model

L

LDA	Landing Distance Available
LEA	Local Enforcement Agency
LEI	Lead Environmental Inspector
LSA	LSA Associates, Inc.
LUST	leaking underground storage tank
LWCF	Land and Water Conservation Fund

M

μ/m^3	micrograms per cubic meter
MG	million gallons
MGTOW	maximum gross takeoff weight
MLTP	Mel Leong Treatment Plant
MLTP–IWP	Mel Leong Treatment Plant – Industrial Waste Process
MOC	Maintenance Operations Center

N

NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act
NLR	Noise Level Reduction
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOA	Notice of Availability
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NWIC	Northwest Information Center

O

O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment

P

PDT	Pacific Daylight Time
P.L.	Public Law
PFMC	Pacific Fishery Management Council
PG&E	Pacific Gas and Electric
PM_{10}	particulate matter equal to less than 10 microns in diameter
$PM_{2.5}$	particulate matter equal to less than 2.5 microns in diameter
ppm	parts per million
PRC	Public Resource Code

R

R&A	Ricondo & Associates, Inc.
R&D	research and development

RCRA	Resource Conservation and Recovery Act
RCRA-LQG	Resource Conservation and Recovery Act Large Quantity Generator
REL	runway-entrance hold light
RIL	runway intersection light
RSA	Runway Safety Area
RSIP	Residential Sound Insulation Program
RWQCB	Regional Water Quality Control Board
RWSL	Runway Status Lights
Rwy	Runway

S

SamTrans	San Mateo County Transit District
SB	Senate Bill
SF Bay	San Francisco Bay
sf	square feet
SFO	San Francisco International Airport
SFPD	San Francisco Police Department
SFPUC	San Francisco Public Utilities Commission
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	sulfur dioxide
SSFSC	South San Francisco Scavenger Company
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board

T

TAF	Terminal Area Forecast
THL	take-off hold light
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
TSA	Transportation Security Administration
TWA	Trans World Airlines

U

U.S. 101	U.S. Highway 101
U.S. EPA	U.S. Environmental Protection Agency
U.S.C.	United States Code
URS	URS Corporation
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank

V

VOC	volatile organic compound
VSR	vehicle service road

W

WOB	West-of-Bayshore

APPENDIX A
RUNWAY SAFETY AREA PLANNING STUDIES

Appendix A1
Executive Summaries, Runway Safety Area Planning Studies

San Francisco International Airport
Runway Safety Area Study: Runways 1R-19L and 1L-19R
Executive Summary

Executive Summary

Per Congressional mandate, *"not later than December 31, 2015, the owner or operator of an airport certificated under 49 U.S.C. 44706 shall improve the airport's Runway Safety Areas (RSA) to comply with the Federal Aviation Administration (FAA) design standards required by 14 Code of Federal Regulations (CFR) Part 139."*[1]

Based on this mandate, the San Francisco Airports District Office (ADO) of the FAA requested that San Francisco International Airport (SFO or the Airport) evaluate and determine if all the RSAs for its four runways meet current FAA design standards.

In order to ensure the needs of the various airport users were considered, the Airport convened a RSA Working Group. This group was composed of various Airport divisions (Planning, Facilities, Operations, and Community Affairs), SFO Airport Traffic Control (ATC) staff, FAA regional and ADO staff, & Ricondo and Associates staff. The group was tasked with providing input on the various RSA alternatives developed as part of this study. The working group evaluated the merits of the RSA alternatives presented and, taking into account input from the various Airport member airlines, assisted in the determination of the preferred RSA alternatives.

The working group was tasked to evaluate the RSAs for Runways 1L-19R, 1R-19L, 10L-28R and 10R-28L. This report discusses the analyses and recommendations specifically for Runways 1L-19R and 1R-19L. The analyses and recommendations for Runways 10L-28R and 10R-28L are provided in a separate report.

A review of existing conditions shows that the RSA at the south end of Runway 1R-19L is limited by an Airport Operations Area (AOA) fence along the canal located approximately 777 feet beyond the runway end. At the north end, the RSA is limited by a service road, a sea wall and the San Francisco Bay. The RSA length from the Runway 19L end to the service road is approximately 246 feet.

A review of existing conditions shows that the RSA at the south end of Runway 1L-19R is limited by the South Detention Basin, approximately 609 feet from the Runway 1L end. At the north end of Runway 1L-19R the RSA is limited by a service road, a sea wall and the San Francisco Bay. As shown, the RSA length beyond the Runway 19R end is approximately 177 feet to the service road.

The RSA refined alternatives for Runways 1R-19L and 1L-19R were developed and evaluated in accordance with FAA AC 150/5300-13, *Airport Design*; FAA Order 5200.8, Runway *Safety Area Program*; and FAA AC 150/5220-22A *Engineered Material Arresting System (EMAS) for Aircraft Overruns.*

The Preferred Alternative is shown in **Exhibit ES-1**. As shown, the Preferred Alternative incorporates a combination of "Shift Runway", "Declared Distances" and "EMAS" concepts that were determined to be the recommended practicable RSA improvement alternatives for Runway 1L-19R and Runway 1R-19L. It was the consensus of the RSA Working Group that the Preferred Alternative incorporates the features necessary to achieve to the extent practicable, an equivalent

1 Congressional Bill H.R. 3058: Transportation, Treasury, Housing and Urban Development, the Judiciary, District Of Columbia, and Independent Agencies Appropriations Act, 2006; Public Law 109–115, Nov. 30, 2005, 119 STAT. 2401

RSA for each runway, minimal operational impacts (i.e., not reduce the effective takeoff length), and enhancements to operational capability.

Analyses should be performed to confirm the final locations of thresholds relative to approach obstructions and assess potential runway occupancy time impacts resulting from changes in runway exit locations. Also, coordination with FAA on the disposition of navigational aids located within the RSA and modification to approach procedures based on threshold relocations will be required. Further analysis of these potential issues is recommended prior to implementation.

San Francisco International Airport
Runway Safety Area Study: Runways 10R-28L and 10L-28R
Executive Summary

Executive Summary

Per Congressional mandate, *"not later than December 31, 2015, the owner or operator of an airport certificated under 49 U.S.C. 44706 shall improve the airport's Runway Safety Areas (RSA) to comply with the Federal Aviation Administration (FAA) design standards required by 14 Code of Federal Regulations (CFR) Part 139."*[1]

Based on this mandate, the San Francisco Airports District Office (ADO) of the FAA requested that San Francisco International Airport (SFO or the Airport) evaluate and determine if all the RSAs for its four runways meet current FAA design standards.

In order to ensure the needs of the various airport users were considered, the Airport convened a RSA Working Group. This group was composed of various Airport divisions (Planning, Facilities, Operations, and Community Affairs), SFO Airport Traffic Control (ATC) staff, FAA regional and ADO staff, and Ricondo & Associates staff. The group was tasked with providing input on the various RSA alternatives developed as part of this study. The working group evaluated the merits of the RSA alternatives presented and, taking into account input from the various Airport member airlines, assisted in the determination of the preferred RSA alternatives.

The working group was tasked to evaluate the RSAs for Runways 1L-19R, 1R-19L, 10L-28R and 10R-28L. This report discusses the analyses and recommendations specifically for Runways 10L-28R and 10R-28L. The analyses and recommendations for Runways 1L-19R and 1R-19L are provided in a separate report.

A review of existing conditions shows that the Runway 28R localizer, located 630 feet from the Runway 10L threshold is within the dimensions of the RSA and therefore, does not conform to RSA standards. At the east end, a standard RSA is limited by a service road, a sea wall, and the San Francisco Bay. The available RSA dimensions from the Runway 28R end are 322 feet to the constraining service road, and 376 feet to the sea wall and the bay. Several signs and some navigational aids are located within the RSA. The signs are located 160 to 170 feet from the centerline on both sides of the runway.

A review of existing conditions shows that a standard RSA is available at the Runway 10R end. At the east end, the RSA is limited by a service road, a sea wall, and the San Francisco Bay. The RSA dimensions from the Runway 28L end are 324 feet to the constraining service road, and 363 feet to the sea wall and the bay.

The RSA alternatives for Runways 10L-28R and 10R-28L were developed and evaluated in accordance with FAA AC 150/5300-13, *Airport Design*; FAA Order 5200.8, Runway *Safety Area Program*; and FAA AC 150/5220-22A *Engineered Material Arresting System (EMAS) for Aircraft Overruns.* Based on the evaluation and the consensus of the RSA Study Working Group, the "Declared Distances" concept was determined to be the recommended practicable RSA improvement alternative for Runway 10L-28R. This alternative will allow Runway 10L-28R to comply with FAA

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1 Congressional Bill H.R. 3058: Transportation, Treasury, Housing and Urban Development, the Judiciary, District Of Columbia, and Independent Agencies Appropriations Act, 2006; Public Law 109–115, Nov. 30, 2005, 119 STAT. 2401

RSA design standards within acceptable operational, environmental, and financial constraints.

During the preliminary review of the FAA basic concepts, the "Declared Distances" concept was determined to be the recommended practicable RSA improvement alternative for Runway 10R-28L. However, to satisfy airline stakeholders that the Runway 10R departure length would be sufficient for existing payload and/or markets, a refinement to this concept incorporated the relocation of the Runway 10R threshold west by 771 feet to preserve existing Runway 10R departure length and enhance departure operations on Runways 10L and 10R.[2] This alternative requires the designation of the Departure End of the Runway (DER) for Runway 28L 329 feet east of the relocated Runway 10R end for departure obstacle clearance. The Preferred Alternative, including refinements is shown in **Exhibit ES-1**. It was the consensus of the RSA Working Group that this Preferred Alternative incorporates the features necessary to achieve an equivalent RSA for each runway, minimize operational impacts (i.e., not reduce the effective takeoff length), and enhance operational capability.

Analyses should be performed to confirm the final locations of thresholds relative to approach obstructions and assess potential runway occupancy time impacts resulting from changes in runway exit locations. Also, coordination with FAA on the disposition of navigational aids located within the RSA and modification to approach procedures based on threshold relocations will be required. Further analysis of these potential issues is recommended prior to implementation.

2 ATC "Southeast Plan."

APPENDIX B
AIRFIELD COMPONENTS AND CHARACTERISTICS

Appendix B1
Declared Distances

Declared distances at airports are a mechanism by which specific lengths of runway pavement are identified for use in aircraft operations. Declared distances are incorporated into the Operations Specifications of commercial aircraft operators that are part of the air carrier certificates and operations certificates issued by FAA under 14 CFR Part 119, as well as into the internal operations manuals of those operators. Pilots of commercial aircraft are required to comply with such specifications and manuals.

The specified distance available for a particular operation such as landing may be different in each direction on the same runway pavement. The FAA defines four declared distances:

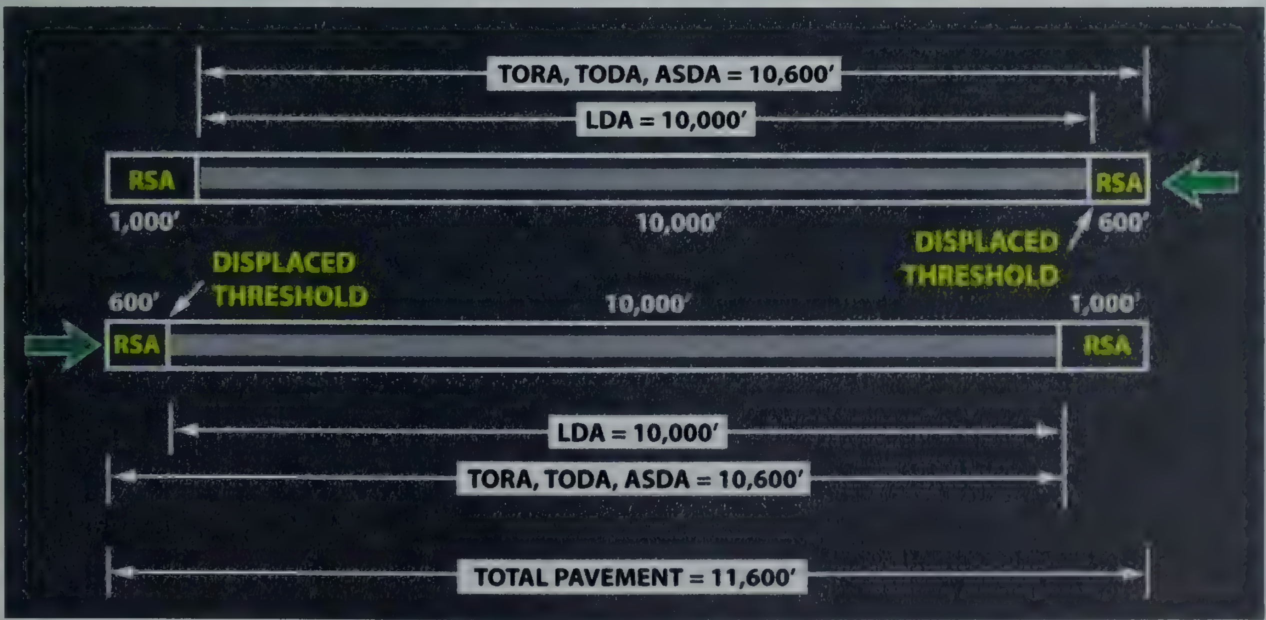
- **Takeoff Run Available** (TORA) – the runway length declared available and suitable for satisfying takeoff run requirements. The TORA is measured from the start of takeoff to a point 200 feet from the beginning of the departure Runway Protection Zone.

- **Takeoff Distance Available** (TODA) – this distance comprises the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA.

- **Accelerate-Stop Distance Available** (ASDA) – the runway plus stopway length declared available and suitable for the acceleration and deceleration of an aircraft that must abort its takeoff. A stopway is an area beyond the takeoff runway able to support the airplane during an aborted takeoff, without causing structural damage to the airplane.

- **Landing Distance Available** (LDA) – the runway length that is declared available and suitable for satisfying aircraft landing distance requirements.

The figure below illustrates how declared distances allow a runway pavement length of 11,600 feet to provide a usable runway length of 10,000 feet for landing and 10,600 feet for takeoffs in both directions while still providing the FAA-required runway safety area dimensions of 600 feet prior to the landing threshold and 1,000 feet beyond the runway end.



APPENDIX C
NOISE

Appendix C1
Aircraft Noise Descriptors

APPENDIX C1

AIRCRAFT NOISE DESCRIPTORS

A variety of noise metrics are used to assess airport noise impacts in different ways. Noise metrics are used to describe individual noise events (such as a single operation of an aircraft taking off overhead) or groups of events (such as the cumulative effect of numerous aircraft operations, the collection of which creates a general noise environment or overall exposure level). Both types of descriptors are helpful in explaining how people tend to respond to a given noise condition. Descriptions of these metrics are provided below.

Decibel, dB – Sound is a complex physical phenomenon consisting of complex minute vibrations traveling through a medium, such as air. These vibrations are sensed by the human ear as sound pressure. Because of the vast range of sound pressure or intensity detectable by the human ear, sound pressure level (SPL) is represented on a logarithmic scale known as decibels (dB). A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet (laboratory-type) listening conditions. An SPL of 120 dB begins to be felt inside the ear as discomfort, and becomes painful at approximately 140 dB. Most environmental sounds have SPLs ranging from 30 to 100 dB.

Because decibels are logarithmic, they cannot be added or subtracted directly like other (linear) numbers. For example, if two sound sources each produce 100 dB, when they are operated together they will produce 103 dB, not 200 dB. Four 100 dB sources operating together again double the sound energy, resulting in a total SPL of 106 dB, and so on. In addition, if one source is much louder than another, the two sources operating together will produce the same SPL as if the louder source were operating alone. For example, a 100 dB source plus an 80 dB source produce 100 dB when operating together. The louder source masks the quieter one.

Two useful rules to remember when comparing SPLs are: (1) most people perceive a 6 to 10 dB increase in SPL between two noise events to be about a doubling of loudness, and (2) changes in SPL of less than about 3 dB between two events are not easily detected outside of a laboratory.

A-Weighted Decibel, dBA – Frequency, or pitch, is a basic physical characteristic of sound and is expressed in units of cycles per second or hertz (Hz). The normal frequency range of hearing for most people extends from about 20 to 15,000 Hz. Because the human ear is more sensitive to middle and high frequencies (i.e., 1,000 to 4,000 Hz), a frequency weighting called "A" weighting is applied to the measurement of sound. The internationally standardized "A" filter approximates the sensitivity of the human ear and helps in assessing the perceived loudness of various sounds. In this document all sound levels are A-weighted sound levels and the adjective "A-weighted" has been omitted.

Figure C1-1 charts common indoor and outdoor sound levels. A quiet rural area at nighttime may be 30 dBA or lower, while the operator of a typical gas lawn mower may experience a level of 90 dBA. Similarly, the level in a library may be 30 dBA or lower, while a listener at a rock band concert may experience levels near 110 dBA.

FIGURE C1-1
COMMON OUTDOOR AND INDOOR SOUND LEVELS

Source: URS Corporation, 2008

Maximum A-Weighted Noise Level, L_{max} – Sound levels vary with time. For example, the sound increases as an aircraft approaches, then falls and blends into the ambient or background as the aircraft recedes into the distance. Because of this variation, it is often convenient to describe a particular noise "event" by its highest or maximum sound level (L_{max}). Note L_{max} describes only one dimension of an event; it provides no information on the cumulative noise exposure generated by a sound source. In fact, two events with identical L_{max} may produce very different total exposures. One may be of very short duration, while the other may be much longer.

Sound Exposure Level, SEL – The most common measure of noise exposure for a single aircraft flyover is the SEL. SEL is a summation of the A-weighted sound energy at a particular location over the true duration of a noise event normalized to a fictional duration of one second. The true duration is defined as the amount of time the noise event exceeds background levels. For events lasting more than one second, SEL does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event.

The normalization to the fictional duration of one second enables the comparison of noise events with differing true duration and/or maximum level. Because the SEL is normalized to one second, it will almost always be larger in magnitude than the L_{max} for the event. In fact, for most aircraft events, the SEL is about 7 to 12 dB higher than the L_{max}. Additionally, since it is a cumulative measure, a higher SEL can result from either a louder or longer event, or some combination.

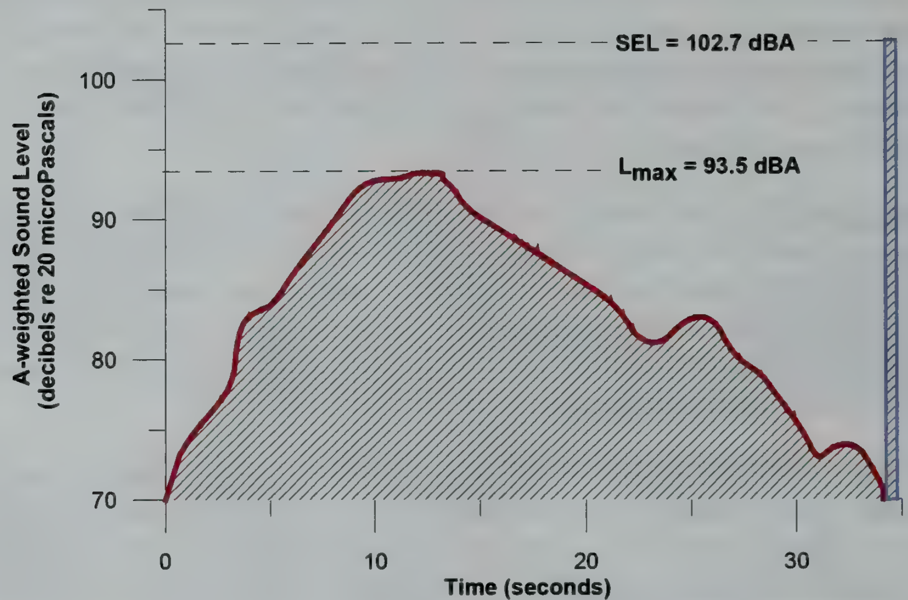
As SEL combines an event's overall sound level along with its duration, SEL provides a comprehensive way to describe noise events for use in modeling and comparing noise environments. Computer noise models, such as the one employed for this document, base their computations on these SELs.

Figure C1-2 shows an event's "time history," the variation of sound level with time. For typical sound events experienced by a fixed listener, like a person experiencing an aircraft flying by, the sound level rises as the source (or aircraft) approaches the listener, peaks, and then diminishes as the aircraft flies away from the listener. The area under the time history curve represents the overall sound energy of the noise event. The L_{max} for the event shown in the figure was 93.5 dBA. Compressing the event's total sound energy into one second to compute its SEL yields 102.7 dBA.

Equivalent Sound Level, L_{eq} – Equivalent sound level (abbreviated L_{eq}) is a measure of the exposure resulting from the accumulation of A-weighted sound levels over a particular period of interest (e.g., an hour, an 8-hour school day, nighttime, or a full 24-hour day). However, because the length of the period can be different depending on the time frame of interest, the applicable period should always be identified or clearly understood when discussing the metric. Such durations are often identified through a subscript, for example $L_{eq(8)}$ or $L_{eq(24)}$.

Conceptually, L_{eq} may be thought of as a constant sound level over the period of interest that contains as much sound energy as the actual time-varying sound level with its normal "peaks" and "dips." In the context of noise from typical aircraft flight events and as noted earlier for SEL, L_{eq} does not represent the sound level heard at any particular time, but rather represents the total sound exposure for the period of interest. Also, it should be noted that the "average" sound level suggested by L_{eq} is not an arithmetic value, but a logarithmic, or "energy-averaged," sound level. Thus, loud events tend to dominate the noise environment described by the L_{eq} metric.

FIGURE C1-2
COMPARISON OF MAXIMUM SOUND LEVEL (L_{MAX}) AND SOUND EXPOSURE LEVEL (SEL)

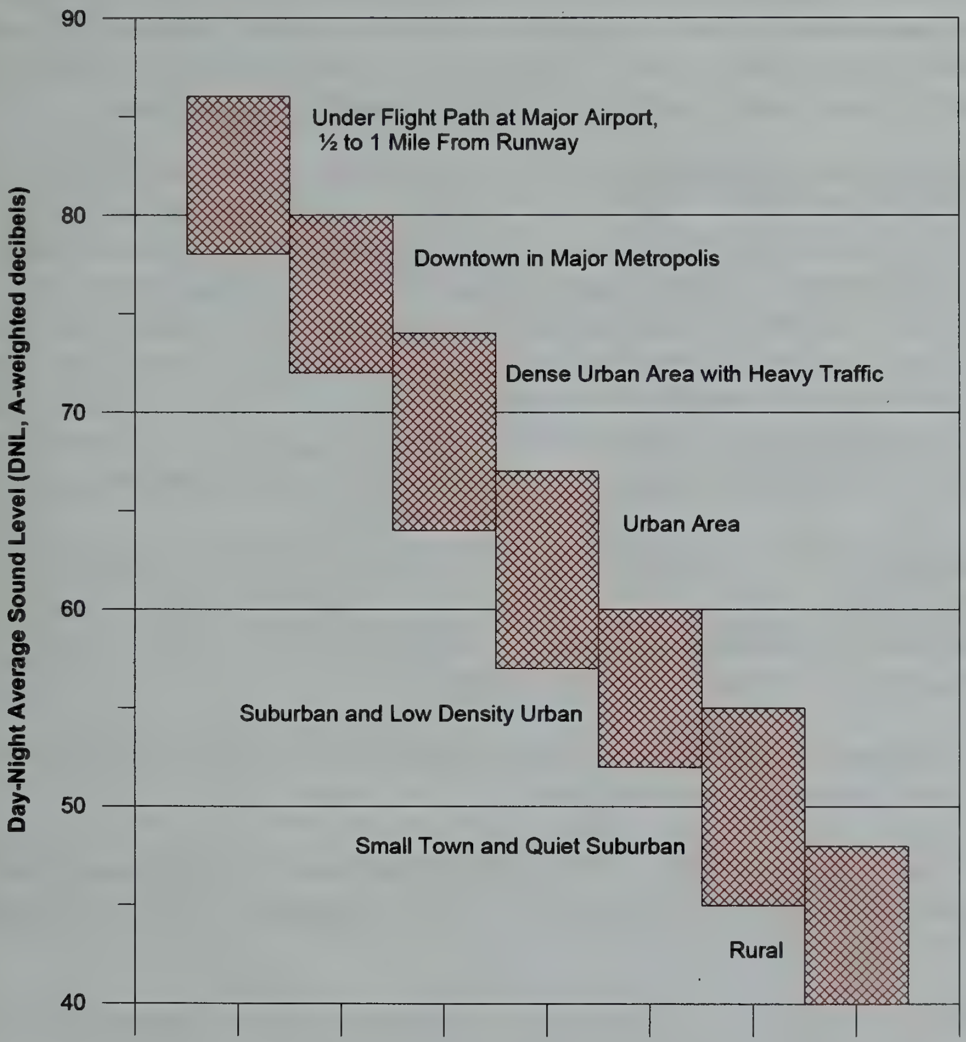


Day-Night Average Sound Level and Community Noise Equivalent Level – Time-averaged sound levels are measurements of sound levels averaged over a specified length of time. These levels provide a measure of the average sound energy during the measurement period. For the evaluation of community noise effects, and particularly aircraft noise effects, the Day-Night Average Sound Level (DNL) or the Community Noise Equivalent Level (CNEL) is used. Both metrics are similar to the Equivalent Sound Level (L_{eq}) except that they compensate for the widely assumed increase in people's sensitivity to noise during nighttime hours. Each aircraft operation occurring between 10:00 p.m. and 7:00 a.m. is treated as if it were 10 operations. Similarly, CNEL (but not DNL) includes a penalty weighting for operations taking place between 7:00 and 10:00 p.m. in the evening. Each aircraft operation during these hours is counted as if it were three operations. Logarithmically, these multipliers are the equivalent of adding 10 dB to the noise level of each nighttime operation and 4.77 dB to the noise level of each evening operation. These noise level penalties are intended to correspond to the drop in background noise level that studies have found takes place from daytime to evening and nighttime in a typical community. The evening and nighttime decrease in ambient sound levels—from both outdoor and indoor sources—is commonly considered to be the principal explanation for people's heightened sensitivity to noises during these periods. (Caltrans, 2002).

CNEL is the primary noise descriptor of this study. CNEL is a 24-hour time-weighted-average noise metric expressed in A-weighted decibels (dBA) that accounts for the noise levels (in terms of SEL) of all individual aircraft events, the number of times those events occur, and the time of day at which they occur. Values of CNEL can be measured with standard monitoring equipment or predicted with computer models. This document uses estimates of CNEL from an FAA-approved computer-based noise model.

Typical DNL values for a variety of noise environments are shown in **Figure C1-3**. DNL values can be approximately 85 dBA outdoors under a flight path within a mile of a major airport and 40 dBA or less outdoors in a rural residential area. CNEL values would be similar.

FIGURE C1-3
TYPICAL RANGE OF OUTDOOR COMMUNITY DAY-NIGHT AVERAGE SOUND LEVELS



Source: DOD, 1978

Due to the CNEL and DNL descriptors' close correlation with the degree of community annoyance from aircraft noise, CNEL and DNL have been formally adopted by most federal agencies for measuring and evaluating aircraft noise for land use planning and noise impact assessment. CNEL has been adopted by the State of California. Federal committees such as the Federal Interagency Committee on Urban Noise (FICUN) and the Federal Interagency Committee on Noise (FICON), which includes the Environmental Protection Agency (EPA), Federal Aviation Administration (FAA), Department of Defense (DOD), Department of Housing and Urban Development (HUD), and Veterans Administration (VA), found DNL to be the best metric for land use planning. They also found no new cumulative sound descriptors or metrics of sufficient scientific standing to substitute for DNL. Other cumulative metrics could be used only

to supplement, not to replace DNL. Furthermore, FAA Order 1050.1E for environmental impact studies requires that DNL be used in describing cumulative noise exposure and in identifying aircraft noise/land use compatibility issues, although the FAA recognizes CNEL as an alternative metric for California (EPA, 1974; FICUN, 1980; FICON, 1992; 14 CFR part 150, 2007; FAA, 2006).

Time-Above a Specified Level – The Time-Above a Specified Level (TA) metric describes the total number of minutes that instantaneous sound level (usually from aircraft) are above a given threshold. For example, if the natural ambient noise level is the specified threshold, the metric would be referred to as "$TA_{natural}$." The TA metric is typically associated with 24-hour annual average daily conditions but can be used to represent any time period. Any threshold may be chosen for the TA calculation.

Number of Events Above a Specified Level – Number of Events Above (NA) is a noise metric that reflects the average number of times noise equals or exceeds a chosen threshold level during a specified time period. NA contours can be depicted at any noise threshold level (x) and any user-defined number of events (z), using the notation "NAx(z)," meaning "z" events at or above noise level "x." These analysis parameters (x and z) may differ in each affected community, based on specific circumstances. No guidelines have yet been established for NA analyses, but individual jurisdictions may apply federal guidelines in such a way as to reflect unique conditions at each airport. Therefore, each jurisdiction has some latitude in establishing local noise standards. The NA metric provides for much flexibility and can be tailored to any noise environment, such as daytime, nighttime, or any user-defined number of hours.

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Appendix C2
Noise Analysis Study: San Francisco International Airport Runway Safety Area Environmental Assessment

Noise Analysis
Technical Appendix

San Francisco International Airport
Runway Safety Area Environmental Assessment

Prepared for:
URS Corporation

Prepared by:
BridgeNet International
20201 SW Birch Street, Suite 250
Newport Beach, CA 92660

March 2011

Table of Contents

Tables

Figures

Noise Analysis Appendix

Introduction

This appendix presents the assumptions associated with existing and future noise conditions at San Francisco International Airport in terms of CNEL noise contours for the San Francisco International Airport Environmental Study for the Runway Safety Area analysis.

Existing Baseline Noise Modeling Inputs

Existing Aircraft Operations

The existing noise environment for San Francisco International Airport was evaluated based upon the level of aircraft operations in 2010, and the associated airport operational characteristics; for this environmental study, the baseline or existing noise exposure contour maps reflect annual conditions. The development of the baseline conditions used data from a variety of sources. The sources of data for this study include:

- Aircraft tower counts
- Aircraft situational display to industry (ASDI), for IFR aircraft
- Operations flight information and radar data from the Airport Noise and Operations Management System (ANOMS)
- Discussions with Airport Noise Abatement Office staff

Aircraft noise exposure maps were generated using the FAA's Integrated Noise Model (INM); INM version 7.0b was used for this Environmental Assessment (EA). The INM computer model requires a variety of operational data to evaluate the noise environment around an airport. These data include the following information, which are discussed in detail in the following paragraphs:

- Total aircraft activity levels
- Aircraft fleet mix categories
- Detailed fleet mix
- Time of day
- Runway use
- Departure and arrival procedures
- Flight paths
- Flight path utilization

Total Aircraft Activity Levels

The total aircraft operational levels were derived directly from the FAA's ATC tower activity data, called tower counts. The tower count data showed that, for 2010, there were a total of 387,248 operations, or an average of 1,061 operations per day (an operation is one takeoff or one landing). **Table A1** summarizes the tower count operational data for 2010.

Table A1
AIRPORT TOWER COUNTS FOR BASELINE PERIOD (2010)
San Francisco International Airport RSA Environmental Assessment

Category	Annual Operations	Average Daily Operations
Air Carrier	288,475	790.3
Air Taxi	83,493	229.7
Civil	12,570	34.4
Military	2,710	7.4
TOTAL	**387,248**	**1,060.9**

Calendar Year 2010
Source: San Francisco International Airport

Aircraft Fleet Mix Categories

Breakdowns by aircraft fleet mix are presented within this section, with further refinements of these categories in the subsequent section, *Detailed Aircraft Fleet Mix*. Aircraft fleet mix categories are defined relative to type of aircraft (i.e., jet or propeller), as well as size and noise characteristic. These categories were determined from the San Francisco International Airport's ANOMS data and ASDI radar data sources. **Table A2** presents operations for the different categories of aircraft. It is not possible to definitively categorize all of the operations into unique groups, although the following aircraft groupings do generally define the categories of operations that occur at the Airport and will be used within this study.

Table A2
OPERATIONS BY AIRCRAFT CATEGORY - 2010 BASELINE PERIOD
San Francisco International Airport RSA Environmental Assessment

Aircraft Category	Daily Operations	Annual Operations
Wide body (Long-haul)	84.8	30,953
Wide body (Medium-haul)	47.3	17,279
Narrowbody (Quieter)	420.9	153,631
Narrowbody (B757)	115.9	42,304
Narrowbody (Louder)	21.5	7,854
Regional Jet	171.4	62,570
Commuter Propeller	120.9	44,139
Business Jet (Large)	25.0	9,119
Business Jet (Med/Small)	26.7	9,737
General Aviation (Propeller)	13.5	4,931
Military (Fixed wing)	3.3	1,188
Helicopters (Civil and Military)	9.7	3,541
TOTAL	**1,061.0**	**387,248**

Source: BridgeNet International

Detailed Aircraft Fleet Mix

The specific mix of aircraft that operate at the Airport is one of the most important airport noise exposure factors. The fleet mix assumptions are presented in **Table A3**. This table presents the average daily operations for each type of aircraft used in the INM noise model, as well as a description of these aircraft.

The aircraft fleet mix data reported in the previously-identified sources does not identify the specific engine type used on the aircraft, which is required for noise modeling with INM. Therefore, it was necessary to assign an INM aircraft type. For instance, an aircraft could be equipped with one of three different engines; each has a different noise profile. The INM aircraft type assigned for each of the aircraft operating at San Francisco International Airport was based upon the INM type that most closely matched the type of aircraft (and aircraft/engine combination) that operates at the Airport. Some aircraft with smaller numbers of operations were grouped into the aircraft type that was most representative of the characteristics of that aircraft. In addition, some aircraft types are not in the model and are assigned a type that the FAA has determined to most closely match that aircraft. For example, the CRJ700 is not in the INM model, and the FAA states to use the CRJ900 as a substitution aircraft. For this EA, the following INM aircraft substitutions were approved by the FAA:

Aircraft	Aircraft INM Substitution	Reason
Boeing 747-8	B747-400	INM v7.0b does not have a 747-8 aircraft. The FAA recommends the B747-400 as a substitute aircraft.
Boeing 787	Airbus A-330	INM v7.0b does not have a B-787 aircraft profile; the A-330 most closely matches the anticipated noise profile of the B-787 and recommended by the FAA.

Table A3

DETAILED OPERATIONS BY INM AIRCRAFT TYPE - 2010 BASELINE PERIOD

San Francisco International Airport RSA Environmental Assessment

INM Type	Category	2010 Daily Opeations	2010 Annual Operations
74720B	Widebody Long-Haul	0.16	57
747400		41.19	15,033
777200		23.93	8,733
777300		13.54	4,944
A330-301		1.27	462
A340-211		4.73	1,725
A380			
747-8 (747400)			
787-8 (A330-301)			
767300	Widebody Medium-Haul	32.06	11,704
767400		0.08	30
767CF6		11.55	4,216
A300-622R		0.18	67
A310-304		1.99	725
DC1030		0.69	253
MD11PW		0.78	284
7373B2	Narrowbody (Quieter)	21.10	7,700
737400		6.62	2,418
737500		3.70	1,351
737700		72.09	26,311
737800		41.20	15,039
737900		16.00	5,841
MD9028		1.31	480
A319-131		97.65	35,643
A320-211		150.77	55,031
A321-232		10.46	3,817
757PW	Narrowbody (757)	97.62	35,631
757RR		10.01	3,653
757300		8.27	3,020
DC95HW	Narrowbody (Louder)	0.05	18
MD83		21.47	7,835
CL601 (CRJ2)	Regional Jet	75.39	27,516
CRJ9-ER		81.09	29,596
EMB145		1.02	373
EMB190 (EMB14L)		13.93	5,085
HS748A	Commuter	0.74	271
1900D		1.68	612
DHC8400		1.50	549
EMB120		117.01	42,707
CL600	Business Jet (Large)	8.42	3,072
CNA750		5.62	2,049
GIIB		0.82	298
GIV		10.14	3,700
CIT3	Business Jet (Med small)	2.34	855
CNA55B		9.05	3,303
IA1125		4.24	1,547
LEAR35		6.80	2,481
SABR80		4.25	1,551
BEC58P	General Aviation (Propeller)	1.71	626
CNA441		4.28	1,563
GASEPV		7.51	2,742
C130	Military	1.04	381
C17		1.06	387
F-18		1.15	420
HELO (mil civil)	Helocopter	9.70	3,541
Total		**1060.95**	**387,248**

Source BridgeNet International

Time of Day

In the CNEL metric, a 24-hour day is broken down into day, evening, and night. Evening is defined as 7 p.m. – 10 p.m., and aircraft are penalized by adding 5 dBA to each operation; nighttime is defined as 10 p.m. – 7 a.m., and operations are penalized 10 dBA.

For the 2010 base period, the overall percentage of ***evening*** operations at San Francisco International Airport was 16%; ***nighttime*** operations at San Francisco International Airport was 14%, as summarized in **Table A4**. Of the 1,061 average daily operations, 169 occurred in the evening hours between 7 p.m. and 10 p.m. while 153 operations occur between 10 p.m. and 7 a.m. The specific percentages of daytime, evening, and nighttime of the INM categories are presented in detail in **Table A5.**

Table A4
SUMMARY OF OPERATIONS BY TIME OF DAY (2010)
San Francisco International Airport RSA Environmental Assessment

Time of Day	Arrival	Departure
Day	70%	69%
Evening	19%	13%
Night	11%	17%

Source: BridgeNet International

Table A5
DETAILED OPERATIONS BY TIME OF DAY (2010)
San Francisco International Airport RSA Environmental Assessment

INM Type	Category	2010 Daily Opeations	2010 Annual Operations	Percent Daily Arrivals			Percent Daily Departures		
				Day	Evening	Night	Day	Evening	Night
74720B	Widebody	0.16	57	50%		50%	50%	13%	38%
747400	Long-haul	41.19	15,033	77%	10%	13%	43%	12%	44%
777200		23.93	8,733	59%	29%	12%	56%	19%	24%
777300		13.54	4,944	86%	14%	0%	41%	15%	44%
A330-301		1.27	462	98%		2%	100%		
A340-211		4.73	1,725	78%	21%	1%	33%	59%	7%
A380				77%	10%	13%	48%	12%	40%
747-8 (747400)				77%	10%	13%	48%	12%	40%
787-8 (A330-301)				59%	29%	12%	56%	19%	24%
767300	Widebody	32.06	11,704	55%	34%	12%	63%	14%	23%
767400	Medium-haul	0.08	30	50%	25%	25%	50%	25%	25%
767CF6		11.55	4,216	49%	18%	33%	49%	13%	38%
A300-622R		0.18	67	53%	11%	42%	11%	53%	32%
A310-304		1.99	725	49%	1%	49%	9%	48%	42%
DC1030		0.69	253	49%	3%	46%	23%	49%	29%
MD11PW		0.78	284	99%			96%	3%	3%
7373B2	Narrowbody	21.10	7,700	73%	19%	8%	72%	20%	8%
737400	(Quieter)	6.62	2,418	81%	15%	3%	82%	15%	2%
737500		3.70	1,351	63%	24%	14%	77%	13%	10%
737700		72.09	26,311	65%	20%	15%	71%	16%	12%
737800		41.20	15,039	67%	18%	15%	76%	8%	16%
737900		16.00	5,841	69%	23%	9%	73%	15%	12%
MD9028		1.31	480	58%	12%	30%	65%		35%
A319-131		97.65	35,643	68%	20%	12%	70%	11%	19%
A320-211		150.77	55,031	68%	19%	13%	67%	10%	23%
A321-232		10.46	3,817	42%	50%	7%	56%	8%	36%
757PW	Narrowbody	97.62	35,631	68%	19%	13%	73%	7%	19%
757RR	(757)	10.01	3,653	31%	29%	40%	50%	7%	43%
757300		8.27	3,020	55%	18%	27%	75%	3%	22%
DC95HW	Narrowbody	0.05	18	100%			100%		
MD83	(Louder)	21.47	7,835	74%	21%	5%	62%	5%	33%
CL601 (CRJ2)	Regional Jet	75.39	27,516	76%	16%	7%	70%	22%	9%
CRJ9-ER		81.09	29,596	77%	17%	6%	76%	17%	8%
EMB145		1.02	373	81%	10%	10%	81%	12%	8%
EMB190 (EMB14L)		13.93	5,085	79%	15%	6%	82%	17%	1%
HS748A	Commuter	0.74	271	88%	8%	3%	79%	11%	11%
1900D		1.68	612	61%	13%	25%	60%	14%	25%
DHC8400		1.50	549	91%	8%	1%	90%		9%
EMB120		117.01	42,707	74%	16%	10%	75%	15%	10%
CL600	Business Jet	8.42	3,072	84%	12%	4%	88%	7%	5%
CNA750	(Large)	5.62	2,049	79%	14%	7%	87%	6%	6%
GIIB		0.82	298	81%	11%	8%	82%	10%	8%
GIV		10.14	3,700	81%	12%	6%	88%	5%	7%
CIT3	Business Jet	2.34	855	72%	17%	10%	84%	12%	5%
CNA55B	(Med small)	9.05	3,303	77%	14%	8%	83%	9%	8%
IA1125		4.24	1,547	80%	13%	8%	84%	9%	7%
LEAR35		6.80	2,481	83%	10%	7%	86%	7%	7%
SABR80		4.25	1,551	82%	11%	7%	88%	7%	6%
BEC58P	General Aviation	1.71	626	56%	20%	25%	49%	21%	29%
CNA441	(Propeller)	4.28	1,563	70%	17%	13%	61%	17%	21%
GASEPV		7.51	2,742	80%	11%	9%	75%	12%	13%
C130	Military	1.04	381	100%			100%		
C17		1.06	387	100%			100%		
F-18		1.15	420	100%			100%		
HELO (mil civil)	Helocopter	9.70	3,541	73%	12%	15%	75%	14%	11%

Source BridgeNet International

Runway Use

An additional, important consideration in developing the noise exposure contours is the percentage of time each runway is used. The speed and direction of the wind dictate the direction in which the runways are operated (north versus south). In general, aircraft operate into the wind – departing into the wind and arriving into the wind. When the wind direction changes, operations are shifted to the runway end that favors the new wind direction.

At San Francisco International Airport many other factors also influence which runway is utilized. The aircraft fleet mix has different runway uses based upon aircraft size, performance, and operation type. These factors include:

- Wind speed and direction
- Required runway length for departure by aircraft type and weight
- Noise abatement procedures
- Airport operational efficiency
- Interaction with other bay area airports
- Weather minimums
- Terrain and obstacle clearance

The existing runway use percentages presented in **Table A6** are based upon a full year of 2010 ANOMS data. The table presents the percentage that each runway was used during the daytime, evening, and nighttime hours.

For this study, the runway use was determined for each category of aircraft for the day, evening, and night periods. The most common operational configuration is to arrive on Runways 28L/R and to departure on Runways 01L/R. Large, heavy aircraft often need a longer runway for departure than Runways 01L/01R and will takeoff off on Runway 28R. The second most common operational configuration is to arrive and depart on Runways 28L/R. The third most common operational configuration is to arrive on Runways 19L/R and to departure on Runways 10L/10R. All other configurations are rare and are only used when strong wind conditions dictate the use of those flow conditions.

Table A6

RUNWAY USE ASSUMPTIONS PER AIRCRAFT CATEGORY (2010)

San Francisco International Airport RSA Environmental Assessment

DAY & EVENING DEPARTURES

Aircraft Category	Oper	01L	19R	01R	19L	10L	28R	10R	28L
Wide Body (Long Haul)	D	0.2%		4.2%	0.3%	6.0%	53.4%	1.4%	34.5%
Wide Body (Medium Haul)	D	2.1%	0.7%	38.9%		4.6%	13.6%	3.5%	36.6%
Narrow Body (Quieter/B757)	D	32.1%	1.0%	42.5%		2.3%	4.1%	4.9%	13.1%
Narrow Body (Louder)	D	25.5%	1.2%	46.2%		2.9%	3.6%	6.9%	13.6%
Regional Jets	D	25.8%	1.1%	52.1%		1.5%	3.7%	5.2%	10.6%
Commuter Props	D	52.8%	0.7%	24.8%		0.9%	5.1%	5.4%	10.2%
Business Jets	D	25.3%	0.7%	35.1%		6.0%	27.5%	0.3%	5.2%
Smaller Propeller GA	D	19.7%	1.1%	35.0%		3.5%	31.1%	1.4%	8.2%
Military	D			16.7%		16.7%	55.6%		11.1%

NIGHT DEPARTURES

Aircraft Category	Oper	01L	19R	01R	19L	10L	28R	10R	28L
Wide Body (Long Haul)	D	0.9%		5.5%		13.6%	55.5%	5.1%	19.4%
Wide Body (Medium Haul)	D	20.1%	0.5%	48.8%		3.3%	4.1%	11.0%	12.2%
Narrow Body (Quieter/B757)	D	25.3%	0.4%	52.0%		1.6%	1.5%	6.2%	13.0%
Narrow Body (Louder)	D	21.6%	0.4%	51.3%		1.1%	1.1%	10.7%	13.7%
Regional Jets	D	15.4%	0.9%	63.2%		1.5%	1.3%	7.3%	10.4%
Commuter Props	D	74.1%	0.8%	5.4%			2.5%	7.2%	9.9%
Business Jets	D	16.8%	0.3%	22.9%		16.0%	37.0%	1.3%	5.7%
Smaller Propeller GA	D	30.7%	0.5%	7.7%		17.5%	26.0%	9.6%	7.9%
Military	D			100.0%					

DAY & EVENING ARRIVALS

Aircraft Category	Oper	01L	19R	01R	19L	10L	28R	10R	28L
Wide Body (Long Haul)	A				8.5%	0.2%	39.0%		52.4%
Wide Body (Medium Haul)	A				7.7%	0.1%	56.5%		35.6%
Narrow Body (Quieter/B757)	A		1.1%		6.3%	0.1%	55.7%		36.9%
Narrow Body (Louder)	A		1.6%		8.4%	0.2%	57.1%		32.7%
Regional Jets	A		1.9%		5.7%	0.1%	47.6%		44.6%
Commuter Props	A		1.8%		4.8%	0.1%	42.6%		50.7%
Business Jets	A		1.7%		4.0%	0.1%	78.5%		15.7%
Smaller Propeller GA	A		1.8%		3.4%	0.2%	80.9%		13.7%
Military	A				5.3%		78.9%		15.8%

NIGHT ARRIVALS

Aircraft Category	Oper	01L	19R	01R	19L	10L	28R	10R	28L
Wide Body (Long Haul)	A				6.6%	0.2%	76.9%		16.2%
Wide Body (Medium Haul)	A				6.2%	0.2%	73.2%		20.3%
Narrow Body (Quieter/B757)	A				8.8%	0.0%	73.8%		17.4%
Narrow Body (Louder)	A		2.4%		12.1%		67.5%		18.0%
Regional Jets	A		1.4%		9.9%	0.1%	66.2%		22.4%
Commuter Props	A		1.8%		8.6%	0.2%	64.0%		24.5%
Business Jets	A		1.5%		5.8%		84.2%		8.5%
Smaller Propeller GA	A		2.6%		2.6%	0.4%	82.7%		11.8%
Military	A						100.0%		

Flight Paths/Tracks and Flight Path Use

The FAA has established procedures (oftentimes referred to as flight tracks) for aircraft arriving and departing from San Francisco International Airport. These conventional procedures are not precisely defined ground tracks, but represent a path along the ground over which aircraft generally fly. With more modern procedures that utilize GPS navigation, they are becoming more defined paths. The identification of the location and use of the flight path is based upon radar data from the ANOMS noise monitoring system and ASDI data that identify the procedure being flown by each aircraft. A full year of radar data from both sources for 2010 was used to determine the baseline arrival and departure flight paths and flight path use.

In the development of the existing noise contours, the INM noise model requires aggregating the flight paths into a set of generalized flight tracks of aircraft operating at the Airport. In the INM noise model, a flight track consists of a backbone or center flight path, and the dispersion, or spread, of all flights that use the backbone. This dispersion includes ancillary flight tracks to the backbone; for the San Francisco International Airport RSA EA, each flight track has one backbone and four ancillary flight tracks, two on either side of the backbone. The backbone and ancillary tracks are each assigned a percentage of the operations.

Flight tracks for different operational conditions are presented in the following figures.. INM flight paths are show in **Figures A1** through **A4** for arrivals and departures, respectively. Flight tracks from actual aircraft operations are depicted in **Figures A5 – A12.** The figures are presented as follows:

- INM Flight Tracks
    - Figure A1 – Arrival all Runways
    - Figure A2 – Departure Runways 28 L/R
    - Figure A3 – Departure Runways 10 L/R
    - Figure A4 – Departure Runways 01 L/R and 19 L/R

- Arrival Radar Flight Tracks
    - Figure A5 – Runways 28 L/R
    - Figure A6 – Runways 10 L/R
    - Figure A7 – Runways 01 L/R
    - Figure A8 – Runways 19 L/R

- Departure Radar Flight Tracks
    - Figure A9 – Runways 28 L/R
    - Figure A10 – Runways 10 L/R
    - Figure A11 – Runways 01 L/R
    - Figure A12 – Runways 19 L/R

The INM modeling analysis for existing conditions included a total of 52 departure flight tracks and 28 arrival flight tracks. For the INM study, the flight tracks are modeled in the terminal airspace, or within approximately 10 miles of the airport, well beyond the area of the noise contour.

Climb Profile Analysis

Standard INM inputs use stage length to determine the departure profiles. Changes to the airline industry, including higher aircraft load factors, have had an affect on how aircraft fly. This is illustrated by the total number of passenger enplanements and operations. At San Francisco International Airport, both enplanements and operations were approximately 12% lower in 2007 than in 2000. Since the events of Sept. 11, 2001, passenger enplanements started showing a steady increase in 2003 to present, and total operations did not show an increase until 2006 (0.1% growth, 2005-2006).

Higher load factors result in heavier aircraft flying on shorter haul routes that were traditionally operated with much lower load factors. For example, aircraft flying from SFO – LAX are considered a Stage 1 aircraft, which is a flight between 0 – 499 nautical miles (NM). Due to higher load factors, this departure profile could be a Stage 2 or Stage 3, which represents an aircraft stage length of 500 – 999 and 1,000 – 1,499 NM, respectively. The INM determines that aircraft with longer stage lengths will be heavier. Where approved by the FAA, this study will use actual radar climb profile data to assign the most appropriate standard stage length to each flight. The flight profiles used in this study are not custom, rather a more appropriate use of the standard Stage 1 – 9 INM-defined stages based upon the actual profile flown. This was approved for use with the Boeing 737-3/4/5, Boeing 777, and MD80 aircraft.

Existing Baseline Noise Conditions

Based upon the operational conditions presented above and the INM noise model, noise contours were developed. As required by the FAA, the primary noise criterion to describe the existing noise environment is CNEL.

CNEL Noise Contours. The existing (2010) CNEL noise exposure contours for San Francisco International Airport are presented in the Environmental Assessment document. This figure shows the 65 CNEL, 70 CNEL, and 75 CNEL noise exposure contours. The 60 CNEL noise exposure contour is also presented; this contour is shown for informational purposes only. **Table A7** presents the size of each of the CNEL noise contours in terms of acres. These were obtained from the output of the INM noise model.

Table A7
SIZE OF NOISE CONTOUR - ACRES (2010)
San Francisco International Airport RSA Environmental Assessment

DNL	2010 ACRES
60	17,911.5
65	7,625.4
70	3,027.7
75	1,181.1

Future Noise Modeling Inputs

The Environmental Assessment evaluated the potential impacts from the Runway Safety Area project for two future years. The time periods are 2015, the first full year after scheduled project completion and 2020, which represents 5 years after that first year of completion.

2015 and 2020 Aircraft Operations

The future noise environment for San Francisco International Airport was analyzed based upon operational conditions in the year 2015 and 2020. The forecast is based upon the approved Aviation Demand Forecast (February 2010) prepared by Jacobs Consultancy. The forecast data shows a total of 407,300 operations are anticipated to occur at the Airport in 2015 and 437,096 operations are anticipated to occur at the Airport in 2020. This equates to an average of 1,116 operations per day (an operation is either one takeoff or one landing) in 2015 and 1,197 in 2020.

Aircraft Fleet Mix Categories. Categories of aircraft fleet mix were defined relative to the type of aircraft categories that were used to categorize existing operations. The breakdown by these categories was determined from the Jacobs Consultancy aviation forecast. **Table A8** presents operations for the different categories of aircraft for the 2015 and 2020 time period.

Table A8
OPERATIONS BY AIRCRAFT CATEGORY FOR FUTURE CONDITIONS
San Francisco International Airport RSA Environmental Assessment

Aircraft Category	2015 Daily Operations	2015 Annual Operations	2020 Daily Operations	2020 Annual Operations
Wide body (Long-haul)	116.4	42,492	153.0	55,844
Wide body (Medium-haul)	55.2	20,149	49.1	17,907
Narrowbody (Quieter)	523.9	191,212	624.6	227,978
Narrowbody (B757)	77.4	28,248	42.5	15,495
Narrowbody (Louder)	30.4	11,095	19.8	7,236
Regional Jet	179.4	65,486	196.3	71,631
Commuter Propeller	60.8	22,189	33.0	12,060
Business Jet (Large)	25.2	9,199	30.2	11,037
Business Jet (Med/Small)	27.2	9,929	31.0	11,329
General Aviation (Propeller)	10.0	3,650	8.0	2,924
Military (Fixed wing)	6.0	2,190	6.0	2,193
Helicopters (Civil/Military)	4.0	1,460	4.0	1,462
TOTAL	**1,115.9**	**407,300**	**1,197.5**	**437,096**

Source: BridgeNet International

Detailed Aircraft Fleet Mix. The mix of aircraft that operate at the Airport is one of the most important factors in terms of the noise environment. Fleet mix data were determined from the Jacobs Consultancy forecast that identified different types of aircraft for the future years 2013, 2018, and 2023. This study did a linear interpolation between these years to determine the 2015 and 2020 operations. The fleet mix assumptions are presented in **Table 9**. This table presents the average daily operations for each type of aircraft used in the INM, as well as a description of these aircraft categories.

The INM aircraft type assigned to each of the aircraft operating at SFO was based upon aircraft in the INM database that most closely matched the forecast. Some aircraft with smaller numbers of operations were grouped into the aircraft type that most closely represented those aircraft.

Additional Operational Assumptions

Assumptions such as runway use, time of day, flight tracks and flight track usage, and departure procedures remain the same as with the existing conditions.

Table A9

DETAILED OPERATIONS BY AIRCRAFT TYPE FOR FUTURE CONDITIONS

San Francisco International Airport RSA Environmental Assessment

INM Type	Category	2010 Daily Opeations	Jacobs Forecast Operarations 2013	2018	2023	Interpolated Operations 2015	2020
74720B	Widebody Long-haul	0.16	1.00	1.00	1.00	1.00	1.00
747400		41.19	45.97	35.04	30.04	41.60	33.04
777200		23.93	31.98	37.04	59.08	34.00	45.86
777300		13.54	6.99	17.02	25.03	11.01	20.23
A330-301		1.27	4.00	4.00	4.01	4.00	4.01
A340-211		4.73	4.00	4.00	4.01	4.00	4.01
A380			1.00	1.00	1.00	1.00	1.00
747-8 (747400)			2.00	10.01	17.02	5.20	12.82
787-8 (A330-301)			8.99	23.03	43.06	14.61	31.04
767300	Widebody Medium-haul	32.06	35.97	40.05	19.03	37.60	31.64
767400		0.08	1.00	2.00	2.00	1.40	2.00
767CF6		11.55	6.00	4.00	2.00	5.20	3.20
A300-622R		0.18	1.00	1.00	1.00	1.00	1.00
A310-304		1.99	1.00	1.00	1.00	1.00	1.00
DC1030		0.69	2.00	1.00	1.00	1.60	1.00
MD11PW		0.78	6.99	8.01	11.02	7.40	9.21
7373B2	Narrowbody (Quieter)	21.10	30.86	15.46	8.07	24.70	12.50
737400		6.62	9.69	4.56	2.53	7.76	3.93
737500		3.70	5.41	2.71	1.42	4.33	2.19
737700		72.09	76.94	94.11	113.16	83.81	101.73
737800		41.20	44.97	60.07	77.11	51.01	66.59
737900		16.00	25.98	43.05	60.08	32.81	49.86
MD9028		1.31	2.00	2.00	1.00	2.00	1.60
A319-131		97.65	127.91	158.19	195.27	140.02	173.02
A320-211		150.77	149.89	185.22	218.30	164.02	198.45
A321-232		10.46	12.99	14.02	15.02	13.40	14.42
757PW	Narrowbody (757)	97.62	70.93	43.73	3.64	60.05	27.70
757RR		10.01	7.01	4.33	0.36	5.94	2.74
757300		8.27	10.99	12.01	12.02	11.40	12.02
DC95HW	Narrowbody (Louder)	0.05	1.00	2.00	-	1.40	1.20
MD83		21.47	32.98	23.03	12.02	29.00	18.62
CL601 (CRJ2)	Regional Jet	75.39	26.98	12.01	-	20.99	7.21
CRJ9-ER		81.09	108.92	132.16	170.23	118.22	147.39
EMB145		1.02	9.99	8.01	6.01	9.20	7.21
EMB190 (EMB14L)		13.93	28.98	34.04	35.05	31.00	34.44
HS748A	Commuter	0.74	-	-	-	-	-
1900D		1.68	-	-	-	-	-
DHC8400		1.50	5.00	12.01	12.02	7.80	12.02
EMB120		117.01	64.95	35.04	-	52.99	21.03
CL600	Business Jet (Large)	8.42	8.08	9.11	11.81	8.49	10.19
CNA750		5.62	5.39	6.08	7.88	5.66	6.80
GIIB		0.82	0.78	0.88	1.14	0.82	0.99
GIV		10.14	9.73	10.97	14.22	10.23	12.27
CIT3	Business Jet (Med small)	2.34	2.28	2.55	2.99	2.39	2.72
CNA55B		9.05	8.81	9.85	11.55	9.23	10.53
IA1125		4.24	4.13	4.61	5.41	4.32	4.93
LEAR35		6.80	6.62	7.40	8.67	6.93	7.91
SABR80		4.25	4.14	4.63	5.42	4.33	4.95
BEC58P	General Aviation (Propeller)	1.71	4.00	4.00	2.00	4.00	3.20
CNA441		4.28	4.00	4.00	2.00	4.00	3.20
GASEPV		7.51	2.00	2.00	1.00	2.00	1.60
C130	Military	1.04	1.00	1.00	1.00	1.00	1.00
C17		1.06	1.00	1.00	1.00	1.00	1.00
F-18		1.15	4.00	4.00	4.01	4.00	4.01
HELO (mil/civil)	Helocopter	9.70	4.00	4.00	4.01	4.00	4.01
Total		**1060.95**	**1,084.22**	**1,163.40**	**1,248.71**	**1,115.89**	**1,197.52**

Source: BridgeNet International

Future 2015 and 2020 Baseline Noise Conditions

Future noise contours were developed using cumulative noise levels (i.e., averaged over a period of time). As required by the FAA, the primary noise criterion to describe the future noise environment is the cumulative measure commonly referred to as CNEL.

CNEL Noise Contours. The future 2015 and 2020 baseline CNEL noise exposure contours for San Francisco International Airport are presented in the main body of the environmental document. This figure presents the 65 CNEL, 70 CNEL, and 75 CNEL noise contours. The 60 CNEL noise exposure contour is also shown; this contour is shown for informational purposes only. **Table A10** presents the size of each of the CNEL noise contours in terms of acres.

Future 2015 and 2020 with Project Noise Conditions

The future with project noise conditions was also analyzed. The study assumes that there are no changes to the operational assumptions at the Airport. All assumptions are assumed to be the same as the baseline conditions, except that the takeoff point and landing points on each runway may change with the shifting of the runway ends for the anticipated changes to comply with the RSA standards.

Future with project noise contours were developed using cumulative noise levels (i.e., averaged over a period of time) for 2015 and 2020.

CNEL Noise Contours. The future 2015 and 2020 baseline CNEL noise exposure contours for San Francisco International Airport are presented in the main body of the environmental document. This figure presents the 65 CNEL, 70 CNEL, and 75 CNEL noise contours. The 60 CNEL noise exposure contour is also shown; this contour is shown for informational purposes only. **Table A10** presents the size of each of the CNEL noise contours in terms of acres.

Table A10
SIZE OF NOISE CONTOUR - ACRES (2015 - 2020)
San Francisco International Airport RSA Environmental Assessment

DNL	Base 2015-Acres	Base 2020-Acres	with Project 2015-Acres	With Project 2020-Acres
60	20,755.6	21,589.5	20,656.9	21,490.4
65	8,913.2	9,317.7	8,858.4	9,262.2
70	3,631.8	3,787.0	3,609.4	3,763.2
75	1,463.3	1,522.5	1,455.6	1,514.2

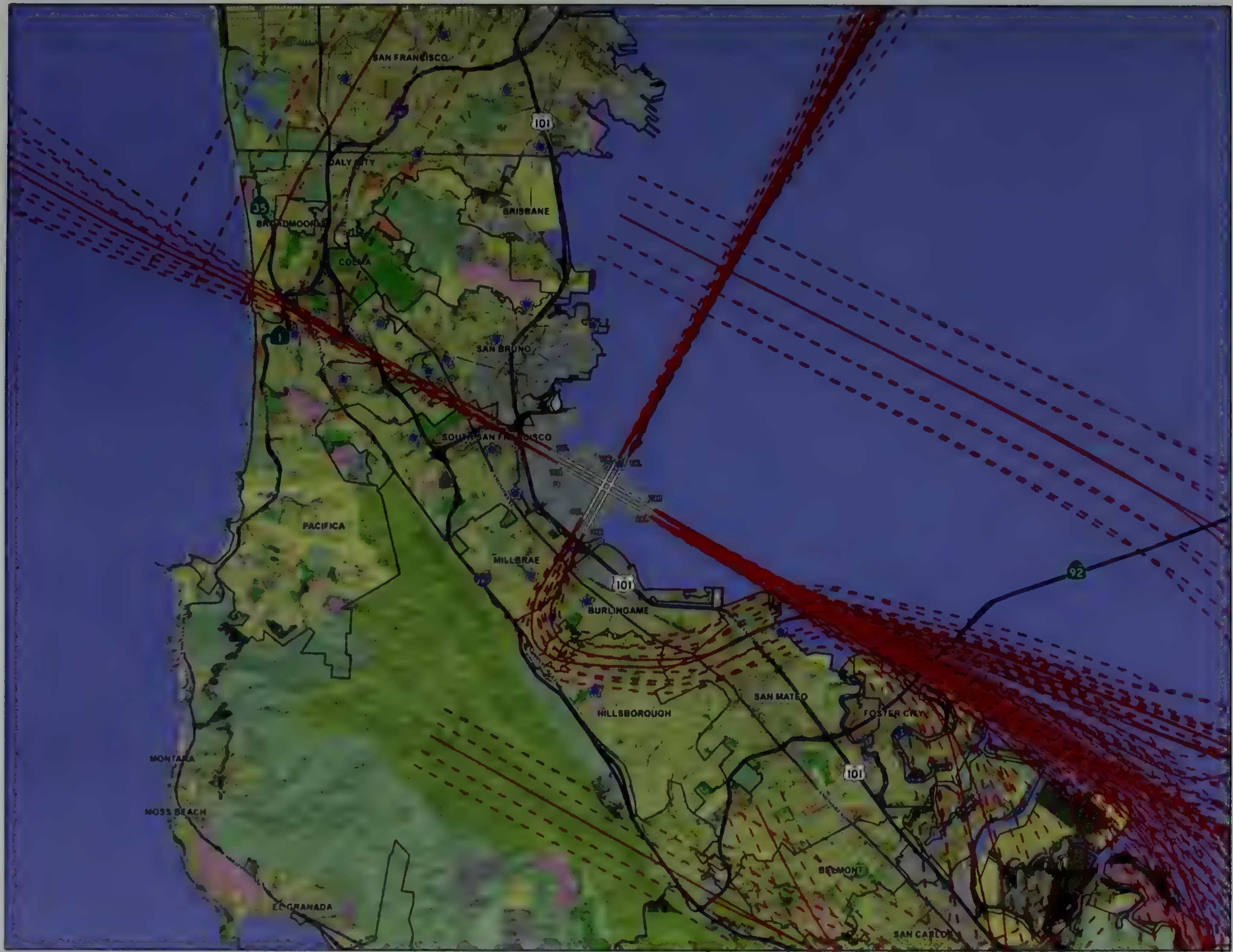


Figure A1
Arrival Flight Tracks (INM)

Land Use Legend

- Single-family Residential
- Multiple-family Residential
- Retail
- Industrial
- Public
- Agricultural
- Open Space
- Water
- Vacant
- Landmarks
- Noise Monitoring Sites

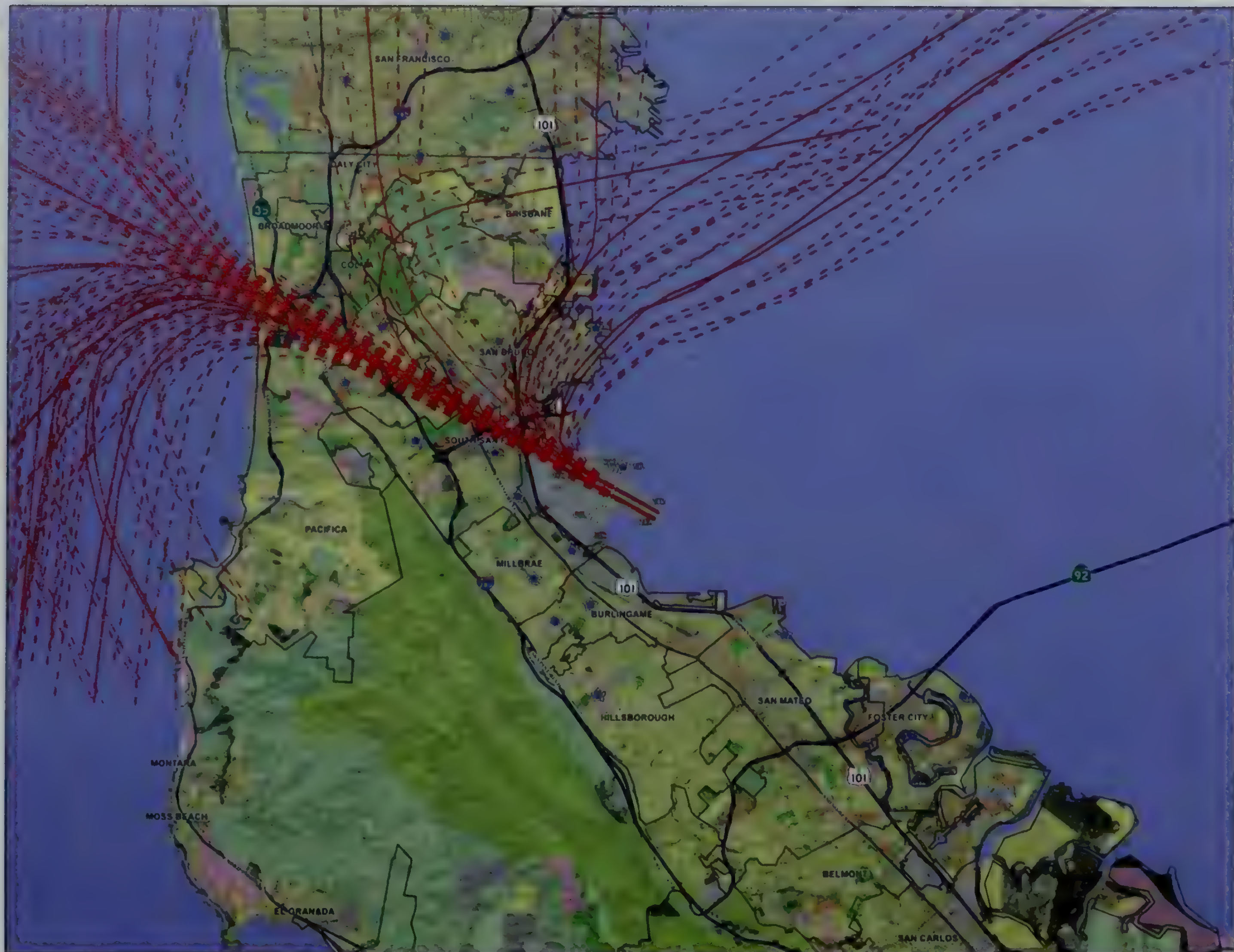
- Main Track
- Sub Track

N

0 1 2 4 miles

SFO
San Francisco International Airport

Figure A2
Departure Flight Tracks (INM)
Runway 28 L/R



Land Use Legend
- Single-family Residential
- Multiple-family Residential
- Retail
- Industrial
- Public
- Agricultural
- Open Space
- Water
- Vacant
- Landmarks
- Noise Monitoring Sites

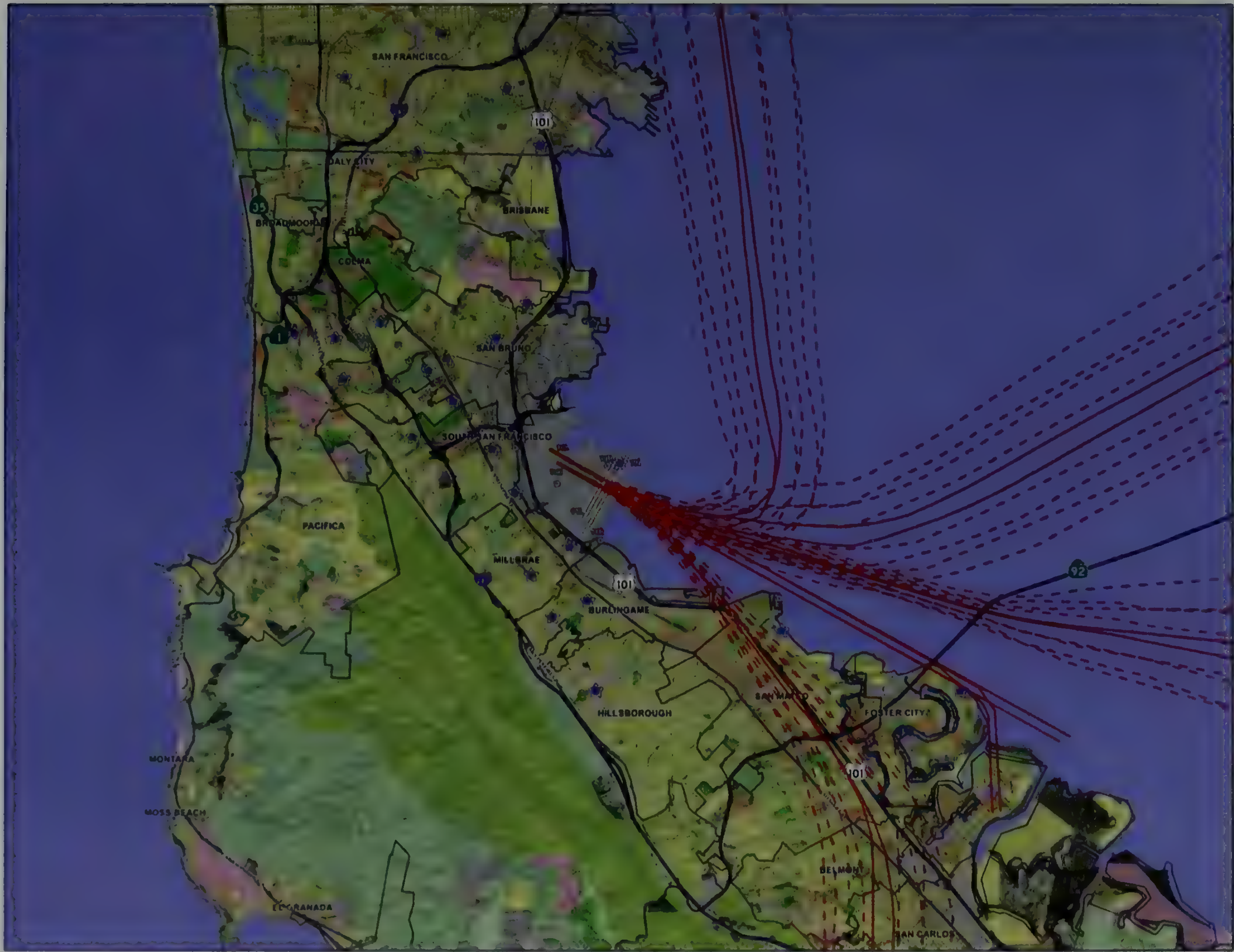
- Main Track
- Sub Track

N

0 1 2 4 miles

SFO
San Francisco International Airport

Figure A3
Departure Flight Tracks (INM)
Runway 10 L/R



Land Use Legend

- Single-family Residential
- Multiple-family Residential
- Retail
- Industrial
- Public
- Agricultural
- Open Space
- Water
- Vacant
- Landmarks
- Noise Monitoring Sites

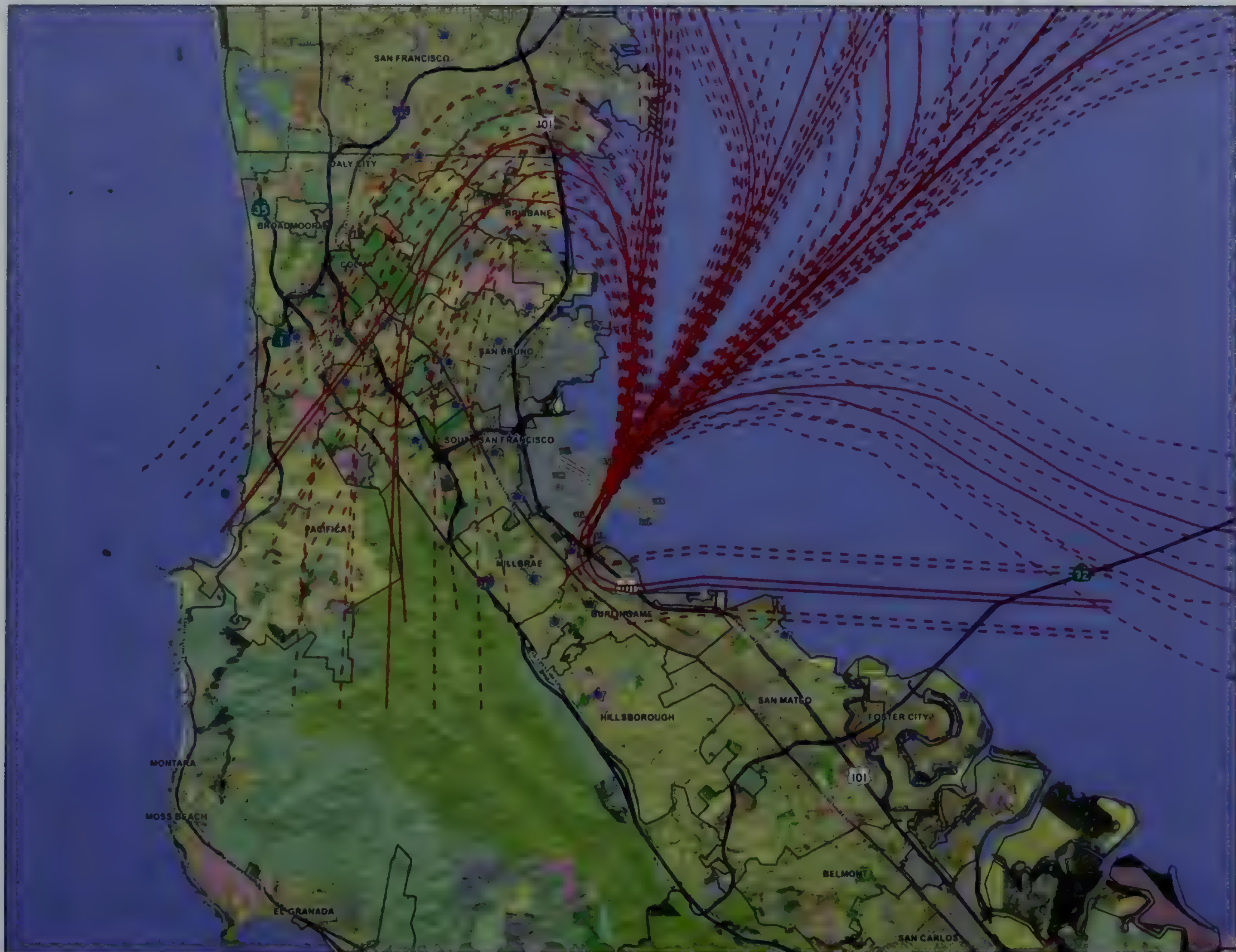
- Main Track
- Sub Track

N

0 1 2 4 miles

SFO
San Francisco International Airport

Figure A4
Departure Flight Tracks (INM)
Runway 01 L/R & Runway 19 L/R



Land Use Legend
- Single-family Residential
- Multiple-family Residential
- Retail
- Industrial
- Public
- Agricultural
- Open Space
- Water
- Vacant
- Landmarks
- Noise Monitoring Sites

- Main Track
- Sub Track

N

0 1 2 4 miles

San Francisco International Airport

Figure A5
Arrival Flight Tracks (Radar)
Runway 28 L/R

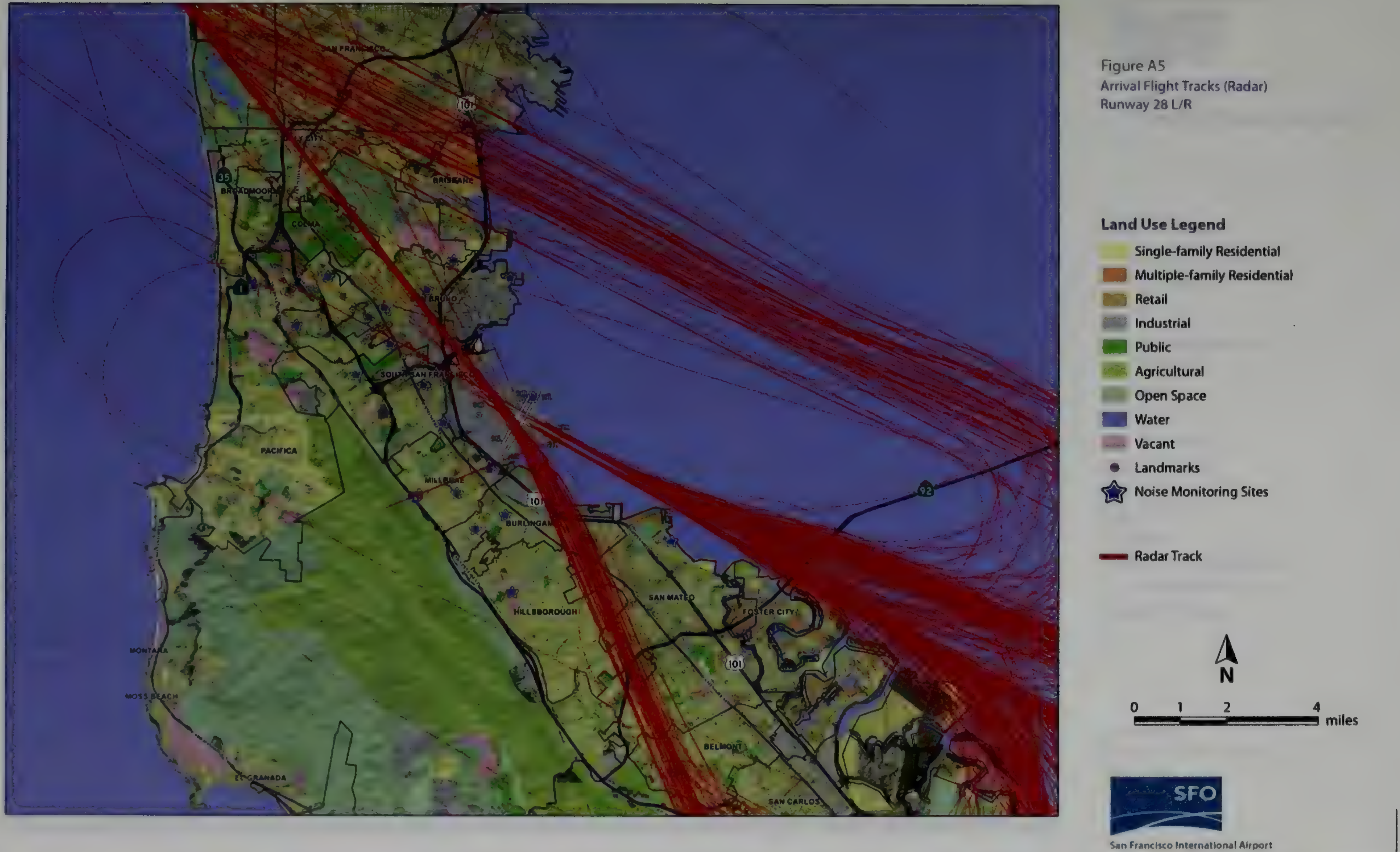


Figure A6
Arrival Flight Tracks (Radar)
Runway 10 L/R

Land Use Legend
- Single-family Residential
- Multiple-family Residential
- Retail
- Industrial
- Public
- Agricultural
- Open Space
- Water
- Vacant
- Landmarks
- Noise Monitoring Sites

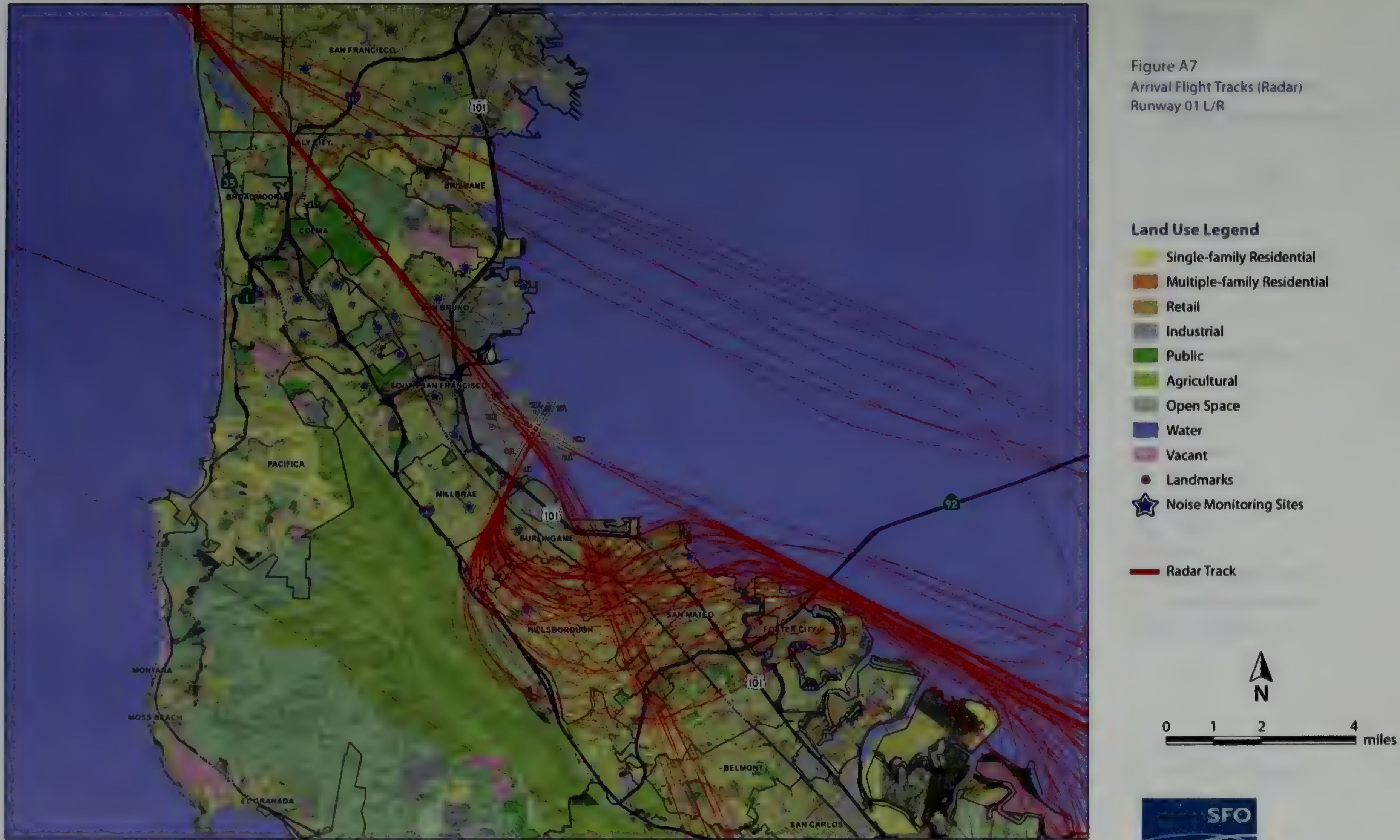
- Radar Track

N

0 1 2 4 miles

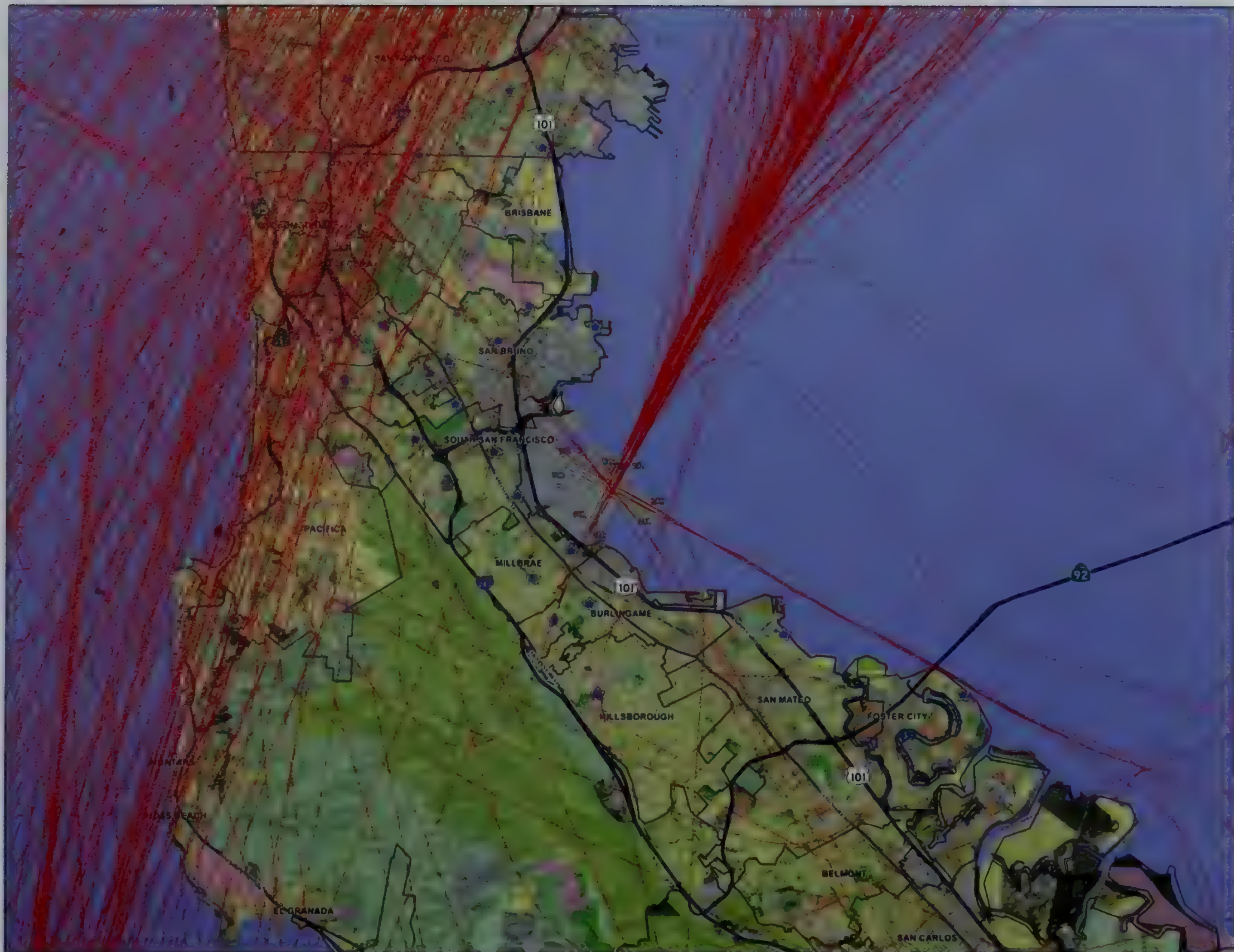
San Francisco International Airport

Figure A7
Arrival Flight Tracks (Radar)
Runway 01 L/R



San Francisco International Airport

Figure A8
Arrival Flight Tracks (Radar)
Runway 19 L/R



Land Use Legend

- Single-family Residential
- Multiple-family Residential
- Retail
- Industrial
- Public
- Agricultural
- Open Space
- Water
- Vacant
- Landmarks
- Noise Monitoring Sites

- Radar Track

N

0 1 2 4 miles

SFO
San Francisco International Airport

Figure A9
Departure Flight Tracks (Radar)
Runway 28 L/R

Land Use Legend

- Single-family Residential
- Multiple-family Residential
- Retail
- Industrial
- Public
- Agricultural
- Open Space
- Water
- Vacant
- Landmarks
- Noise Monitoring Sites

- Radar Track

N

0 1 2 4 miles

SFO
San Francisco International Airport

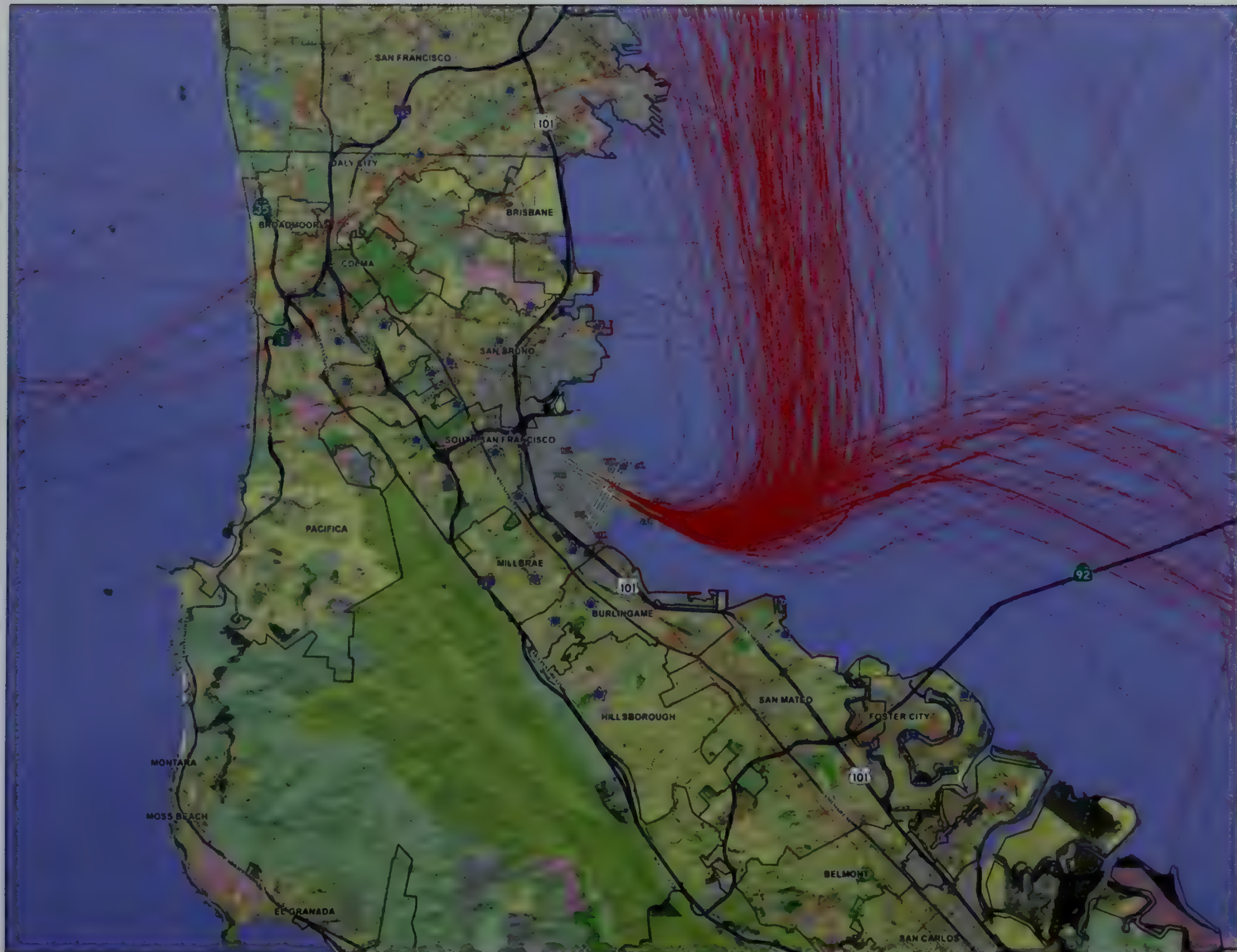


Figure A10
Departure Flight Tracks (Radar)
Runway 10 L/R

Land Use Legend

- Single-family Residential
- Multiple-family Residential
- Retail
- Industrial
- Public
- Agricultural
- Open Space
- Water
- Vacant
- Landmarks
- Noise Monitoring Sites

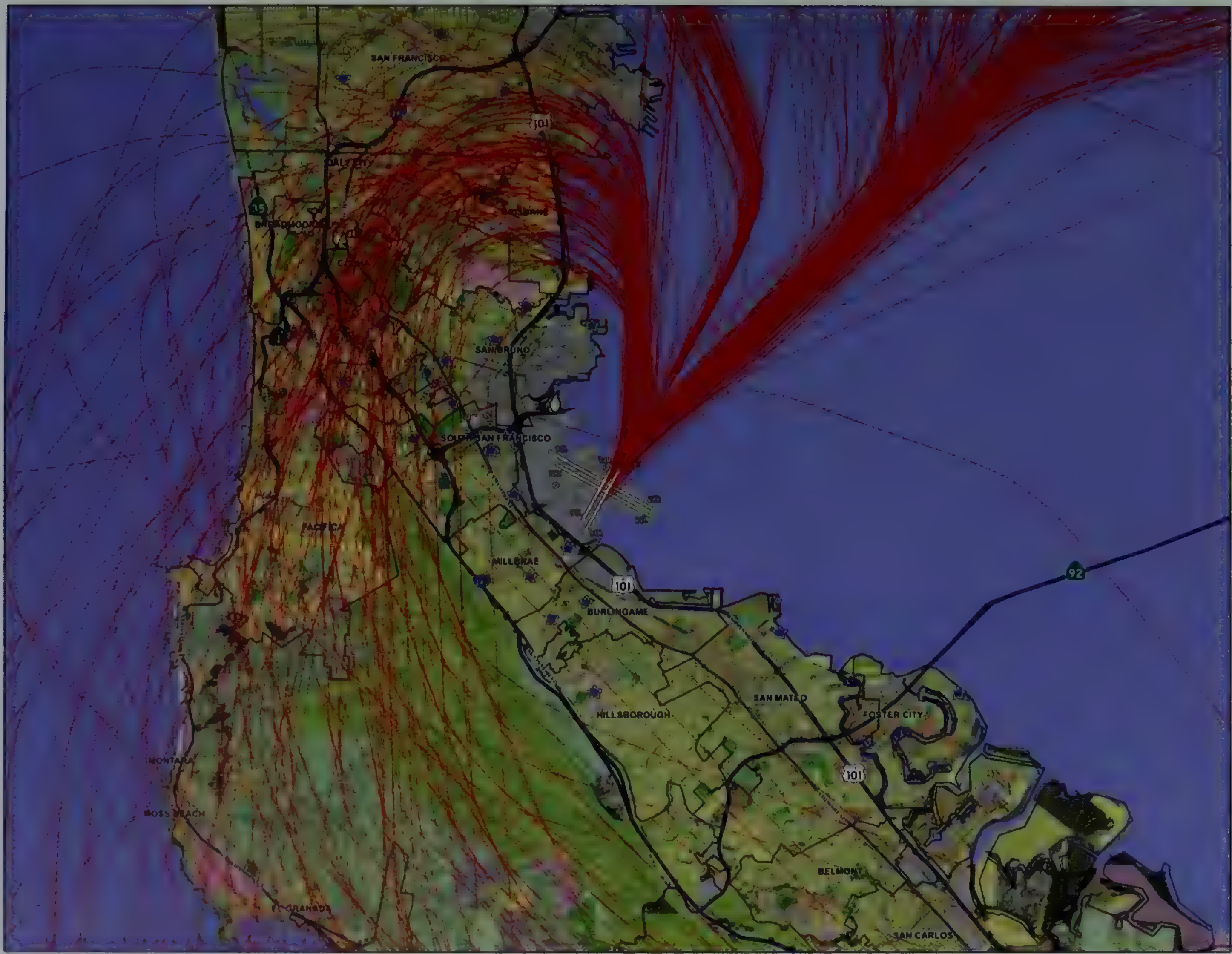
- Radar Track

N

0 1 2 4 miles

SFO
San Francisco International Airport

Figure A11
Departure Flight Tracks (Radar)
Runway 01 L/R



San Francisco International Airport

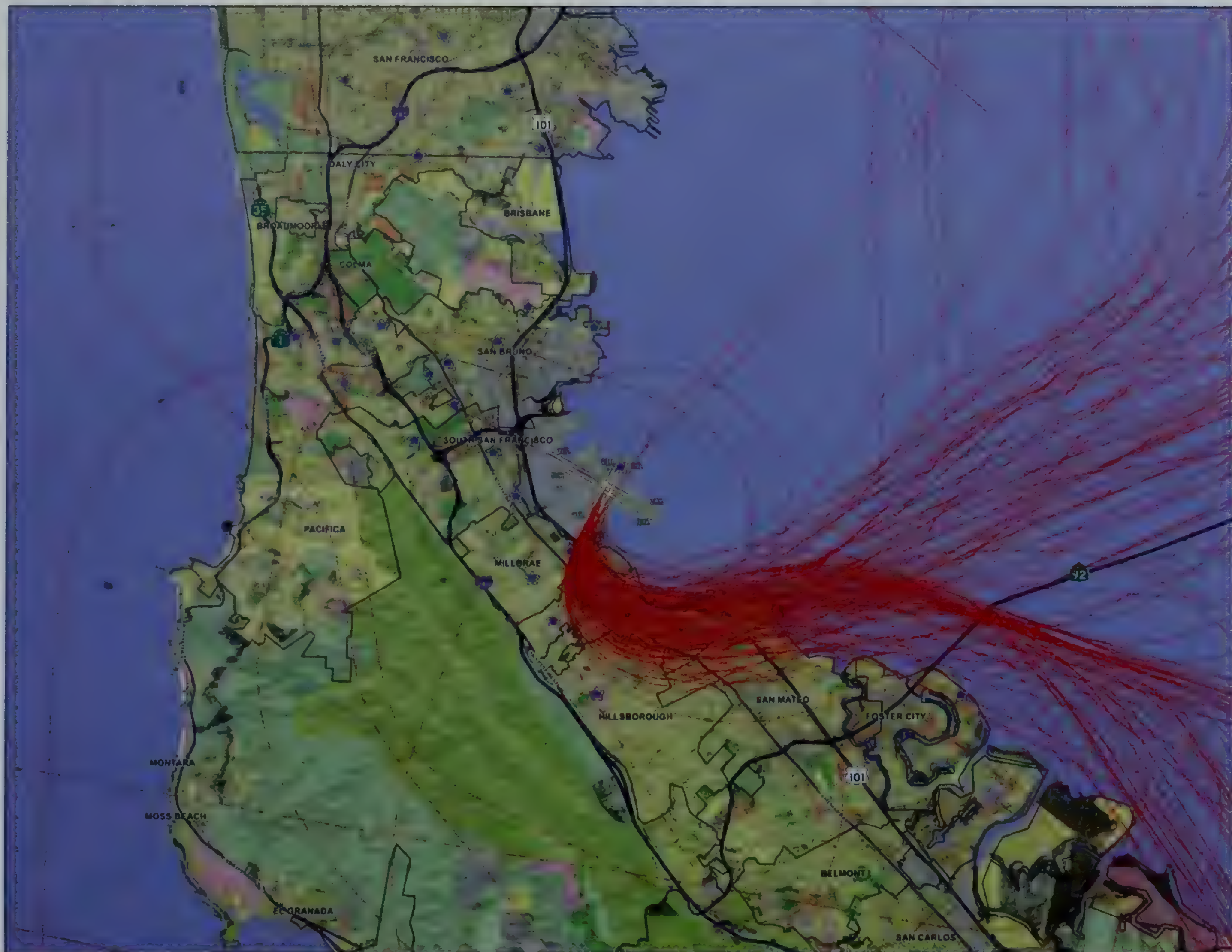


Figure A12
Departure Flight Tracks (Radar)
Runway 19 L/R

Land Use Legend

- Single-family Residential
- Multiple-family Residential
- Retail
- Industrial
- Public
- Agricultural
- Open Space
- Water
- Vacant
- Landmarks
- Noise Monitoring Sites

- Radar Track

N

0 1 2 4 miles

SFO
San Francisco International Airport

Appendix C3
Aircraft Substitution and Stage Length Adjustments

U.S Department
of Transportation
Federal Aviation Administration

Western-Pacific Region
Airports Division

Federal Aviation Administration
P.O. Box 92007
Los Angeles, CA 90009-2007

December 9, 2010

Ms. Audrey Park
Environmental Planner
Bureau of Planning and Environmental Affairs
San Francisco International Airport
P.O. Box 8097
San Francisco, California 94128

**San Francisco International Airport
Runway Safety Area Environmental Assessment**

Dear Ms. Park:

The Federal Aviation Administration (FAA) has completed its review of the City and County of San Francisco's (CCSF) proposed aircraft substitutions and stage length adjustments for aircraft departures modeled at San Francisco International Airport (SFO), in your November 12, 2010 letter. The proposed substitutions are to be used in preparation of a federal Environmental Assessment for the CCSF's proposed Runway Safety Area Program at SFO. The substitutions and stage length adjustments are the same as those requested in preparation of the SFO Noise Exposure Map (NEM) update in December 2008.

The FAA has reviewed the request and, consistent with the NEM update in 2008, will approve the stage length adjustments for the Boeing 737-300, -400 and -500, the Boeing 777-200 and the MD-83 aircraft at SFO. FAA also approves the use of the Integrated Noise Model (INM) aircraft type A330 as substitute for the Boeing 787 aircraft. FAA does *not* approve the use of any substitution aircraft for the Bombardier CRJ-7 and -9 because these aircraft are included in the INM 7.0b aircraft database.

This approval is limited to the Environmental Assessment for the CCSF's proposed Runway Safety Area Program. Any additional projects or non-standard INM input at SFO or any other site will require separate written approval.

If you have any questions concerning this matter, please call me at 310/725-3615.

Sincerely,

David B. Kessler, AICP
Regional Environmental Protection Specialist

Appendix C4
Land Use Assurance Letter

March 1, 2011

Mr. David B. Kessler, AICP
Regional Environmental Protection Specialist
Federal Aviation Administration
Western-Pacific Region Airports Division
P.O. Box 92007
Los Angeles, California 90009

Subject: ***Proposed Runway Safety Area Improvement Program, San Francisco International Airport, CA, Land Use Assurance Letter***

Dear Mr. Kessler:

The City and County of San Francisco, California makes the following statement of land use assurance as required by Section 511 (a)(5) of the Airport and Airway Improvement Act of 1982, as amended:

> *The City and County of San Francisco provides assurance, that appropriate action, within the authority of the City and County of San Francisco, including encouragement of the adoption of zoning laws, has been or will be taken, to the extent reasonable to restrict the use of land adjacent to or in the immediate vicinity of San Francisco International Airport to activities and purposes compatible with normal airport operations both existing and in the future. The City and County of San Francisco works with the adjacent municipalities having land use jurisdiction over land adjacent to or in the immediate vicinity of San Francisco International Airport, and encourages the adoption of zoning laws, to the extent reasonable, to restrict the use of land adjacent to or in the vicinity of the Airport to activities and purposes compatible with airport operations.*

San Francisco International Airport (SFO or the Airport) is physically located in the County of San Mateo, California. Directly to the north, west and south, SFO shares jurisdictional boundaries with the cities of South San Francisco, San Bruno, and Millbrae, respectively. Although SFO is located in unincorporated County of San Mateo, the City and County of San Francisco has land use authority over the Airport. SFO is not therefore, subject to the land use regulations of the County of San Mateo. SFO takes the opportunity to comment on adjacent community land use proposals and zoning changes that may affect the operations of the airport. While SFO works with these various outside agencies and municipalities, it does not have authority to impose such restrictions on the use of land adjacent to or in the vicinity of the Airport.

Post Office Box 8097 San Francisco, California 94128 Tel 650.821.5000 Fax 650.821.5005 www.flysfo.com

If you have any questions regarding this matter, please contact us at your earliest convenience.

Very truly yours,

John L. Martin
Airport Director

APPENDIX D
CULTURAL RESOURCES

Appendix D1
Consultation Documentation

U.S Department
of Transportation
Federal Aviation Administration

Western-Pacific Region
Airports Division

Federal Aviation Administration
P.O. Box 92007
Los Angeles, CA 90009-2007

January 11, 2011

Mr. Milford Wayne Donaldson
State of California
State Historic Preservation Officer
Office of Historic Preservation
1725 23rd Street, Suite 100,
Sacramento, California 95816

Attention: Mr. Tristan Tozer

Dear Mr. Donaldson:

Proposed Runway Safety Area Improvement Program
San Francisco International Airport
San Francisco, San Mateo County, California
Section 106 Coordination

The City and County of San Francisco (CCSF) and the Federal Aviation Administration (FAA) are preparing federal environmental documentation for the proposed safety construction work at San Francisco International Airport. The proposed undertaking includes building various Runway Safety Area (RSA) improvements at each end of the four runways at the airport. RSAs are clear areas around a runway, free of objects and structures. The Airport designs and maintains the RSA to enhance safety if an aircraft undershoots, overruns, or veers off the runway, and to provide greater accessibility for firefighting and rescue equipment during such incidents. Paragraph 2 of FAA Advisory Circular 150/5300-13, *Airport Design,* defines Runway Safety Area as "*A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.*" FAA Order 5200.8, *Runway Safety Area Program* provides the applicable FAA requirements for RSAs.

The Transportation, Treasury, Housing and Urban Development, the Judiciary, The District of Columbia, and Independent Agencies Appropriations Act, 2006 (Public Law 109-115) requires RSAs to meet FAA design standards by December 31, 2015.

It is not practicable to create RSAs for north/south runway pair (Runways 1L/19R and 1R/19L) that meets the applicable FAA Airport Design standards for an RSA. FAA design standards require RSAs 1,000 feet beyond the ends of each runway. The Runway 1/19 pair cannot meet the standard because the runway ends are close to both

San Francisco Bay and Interstate 101. The Airport must keep the existing runway lengths so they can continue to accommodate aircraft departures occurring now.

It is also not practicable to create RSAs for the east/west runway pair (Runways 10R/28L and 10L/28R) for similar reasons. The City and County of San Francisco proposes installation of an Engineered Materials Arresting System (EMAS) at the ends of the runways to further improve the RSAs. EMAS is a type of equipment, installed in the RSA beyond the runway end, made of high-energy absorbing materials used to stop an aircraft. When an aircraft overruns the runway, these materials crush, absorbing the force of the aircraft and decelerating and arresting the aircraft's movement.

The overall RSA Program also includes several related items. These include new underground drainage installations and stormwater pump station; realignment of taxiways and associated runway and taxiway lights and signage; relocation of an electrical substation, and relocation and various adjustments to existing navigation aids. These navigational aids are on the wooden trestles that extend out into San Francisco Bay beyond the end of the approach end of three of the four runways at the airport. The majority of the airport was built on bay fill that initially began in 1927; consequently, the proposed undertaking will occur on bay fill. The most recent fill effort occurred in the early 1970s.

We have enclosed a figure showing the location of the various historical bay fill efforts for the airport. We have also included a specific listing of the components of the proposed undertaking consolidated by runway pair as an enclosure to this letter

The CCSF and FAA are preparing an environmental assessment for the proposed undertaking under the National Environmental Policy Act of 1969. The Federal action is approval of the CCSF's Airport Layout Plan and approval of an application for federal funding assistance for the proposed undertaking.

The FAA is providing the following information on how FAA determined the boundaries of the Area of Potential Effect (APE) for proposed undertaking. FAA used the boundaries of the entire area that would have physical disturbance to delineate the APE. FAA determined these boundaries through consultation with the CCSF on the extent of the proposed RSA program. Since the proposed undertaking will not affect the number or type of aircraft using the airport, FAA delineated a Direct Effects APE only. There would be no change in the indirect effects from aircraft noise resulting from the proposed undertaking. FAA will include this information in the environmental documentation for the proposed project. FAA is seeking comments from your office on the acceptability of the APE's under Title 36, Code of Federal Regulations Section 800.4 *Identification of Historic Properties.*

We are providing the following description of the Direct Effects APE for the proposed undertaking:

Runway Safety Area Program. The enclosed figures show the **Direct Effects APE** (Physical Disturbance Area) for the proposed RSA sites. We have included the APE shown on an aerial photo of the airport and on a portion of a U.S. Geological Survey Quadrangle. This APE for this undertaking is a discontiguous APE that includes the ends of each of the runways where runway safety area work must occur. FAA identified a discontigious APE because there is no construction work for the RSA program in the center portion of the runways. The APE at the runway ends includes the various demolition, construction and navigational aid work described in the enclosed listing. The APE also includes a small portion of the Airport's Vehicle Service Road near the approach end of Runway 1R the CCSF must move. The APE also includes the CCSF owned trestles extending out into San Francisco Bay that support the FAA's Approach Lighting System for three of the runway ends at the airport. The CCSF plans to use staging areas, currently used by the Airport for various current construction and maintenance, for the RSA program. Therefore the Direct Effects APE does not include any new staging areas.

Pursuant to Title 36, Code of Federal Regulations, Section 800.4, the FAA is seeking concurrence with the APE for the proposed undertaking from the California State Historic Preservation Office.

If you have any further questions about this matter, please call me at 310/725-3615.

Sincerely,

David B. Kessler, AICP
Regional Environmental Protection Specialist

Enclosures:

Enclosure 1 – Listing of Proposed RSA Program Elements
Enclosure 2 – Figures showing Direct Effects APE (Physical Disturbance Area) for the proposed undertaking and historical bay fill efforts at the airport.

Cc: SFO-600

Enclosure 1 – San Francisco International Airport
Runway Safety Area Program Elements

Runways 1L-19R and 1R-19L:

- Shift Runway 1L-19R 450 feet to the south by extending the runway pavement at the south end of the runway by 450 feet and reducing the north end of the runway by a similar distance, thus maintaining the existing runway length.

- Shift Runway 1R-19L 200 feet to the south by extending the runway pavement at the south end of the runway by 200 feet and reducing the north end of the runway by a similar distance, thus maintaining the existing runway length.

- Construct an EMAS bed approximately 550 feet long north of the Runway 19R threshold, with a 50-foot setback from the runway end.

- Construct an EMAS bed approximately 440 feet long north of the Runway 19L threshold, with a 35-foot setback from the runway end.

- Construct an EMAS bed approximately 510 feet long south of the Runway 1L threshold, with a 35-foot setback from the runway end.

- Construct an EMAS bed approximately 380 feet long south of the Runway 1R threshold, with a 35-foot setback from the runway end.

- Demolish the existing pavement of Taxiway E and Taxiway L and replace/realign the taxiways to provide access to the relocated threshold of Runways 19L and 19R.

- Relocate portions of the approach lighting for Runway 19L to accommodate the relocated landing threshold.

- Relcateor Install new navigational equipment including but not limited to: Localizer and Glide Slope Antennae, Precision Approach Path Indicators, Runway End Identifier Lights, runway and taxiway edge lighting,

- Demolish portions of the existing Taxiway A pavement and construct a realigned Taxiway A extending between Taxiway B and Taxiway L around the south side of the new EMAS installations at the south end of the runways.

- Construct a new taxiway between Taxiway B, Runway 1L threshold, Runway 1R threshold, and Taxiway L, with a mid-field connection to the relocated Taxiway A.

- Relocate an existing electrical substation
- Relocate the existing vehicle service road and blast fence south of relocated Taxiway A and Runways 1R-19L and 1L-19R adjacent to Interstate 101.
- Realign and extend an existing sea wall adjancent to Taxiway L.
- Construct a new bridge and box culvert over the Millbrae Highline Canal for a taxiway shoulder and realigned vehicle service road, blast fence, and airport operating area fence.
- Fill and/or reconfigure the South Detention Basin, South Oxidation Pond, Bird Ball Ditch, and associated stormwater ponds for construction of the new taxiways, relocation of the vehicle service road, and installation of a new pump station and associated underground drainage pipes.

Runways 10L-28R and 10R-28L:

- Displace the landing thresholds for Runways 28L and 28R by 300 feet to the west and relocate glide slope navigation aids.
- Implement declared distances for Runways 10L-28R and 10R-28L.
- Relocate portions of the approach lighting installations for Runways 28L and 28R.
- Extend the Runway 10R-28L pavement by 771 feet west to preserve the existing Runway 10R takeoff capability.
- Relocate the existing localizer antenna for Runway 28L.
- Construct a new taxiway connection between Taxiway S, the relocated threshold of Runway 10R, and Taxiway Z.
- Install new stormwater drainage pipes between Runways 28R and 28L.

STATE OF CALIFORNIA – THE NATURAL RESOURCES AGENCY
EDMUND G. BROWN, JR., *Governor*

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
1725 23rd Street, Suite 100
SACRAMENTO, CA 95816-7100
(916) 445-7000 Fax: (916) 445-7053
calshpo@parks.ca.gov
www.ohp.parks.ca.gov

February 1, 2011

Reply In Reference To: FAA110113A

David Kessler
Environmental Protection Specialist
Federal Aviation Administration
P.O. Box 92007
Los Angeles, CA 90009-2007

RE: Proposed Runway Safety Area Improvement Program, San Francisco International Airport (SFO), San Francisco, San Mateo County, CA

Dear Mr. Kessler:

Thank you for initiating consultation with me on behalf of the Federal Aviation Administration (FAA) in order to comply with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f), as amended, and its implementing regulation at 36 CFR Part 800. You are asking that I concur that the Area of Potential Effects (APE) for this undertaking has been adequately determined.

The City and County of San Francisco and the FAA are preparing environmental documentation for a number of proposed Runway Safety Area (RSA) improvements at each end of four runways at SFO. The proposed improvements for Runways 1L-19R and 1R-19L include:

- Shifting Runway 1L-19R 450 feet to the south by extending the runway pavement at the south end by 200 feet and reducing the north end of the runway by a similar distance;
- Shifting Runway 1R-19L 200 feet to the south by extending the runway pavement at the south end by 200 feet and reducing the north end of the runway by a similar distance;
- Construction of a 550 foot long Engineered Materials Arresting System (EMAS) bed north of Runway 19R, with a 50-foot setback from the runway end;
- Construction of a 440 foot long EMAS bed north of Runway 19L, with a 35 foot setback from the runway end;
- Construction of a 510 foot long EMAS bed south of Runway 1L, with a 35 foot setback from the runway end;
- Construction of a 380 foot long EMAS bed south of Runway 1R, with a 35 foot setback from the runway end;
- Demolition of Taxiway E and Taxiway L pavement;
- Replacement/realignment of Taxiway E and Taxiway L;
- Relocation portions of approach lighting for Runway 19L;

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- Realignment and demolition of portions of Taxiway A pavement between Taxiways B and L near the southern end of proposed EMAS bed installations;

- Construction of a new taxiway between Taxiway B, the Runway 1L threshold, the Runway 1R threshold, and Taxiway L, with a mid-field connection to the relocated Taxiway A;

- Relocation of electrical substation;

- Relocation of vehicle service road and blast fence south of relocated Taxiway A and Runways 1R-19L and 1L-19R adjacent to Interstate 101;

- Realignment and extension of sea wall adjacent to Taxiway L;

- Construction of bridge and box culvert over the Millbrae Highline Canal to accommodate the realigned vehicle service road, blast fence, and airport operating fence;

- Fill and/or reconfiguration of the South Detention Basin, South Oxidation Pond, Bird Ball Ditch, and associated storm water ponds.

The proposed improvements for Runways 10L-28R and 10R-28L include:

- Relocation of the landing thresholds for Runways 28L and 28R to a point 300 feet to the west of current location and relocation of glide slope navigation aids;

- Implement declared distances for Runways 10L-28R and 10R-28L;

- Relocation of portions of approach lighting installations for Runways 28L and 28R;

- Extension of Runway 10R-28L pavement by 771 feet to the west of its current location;

- Relocation of localizer antenna located at Runway 28L;

- Construction of new taxiway connection between Taxiway S, the relocated threshold of Runway 10R, and Taxiway Z;

- Installation of new storm water drainage pipes between Runways28R and 28L.

The depth of ground disturbance required for this undertaking has yet to be determined. You also note in your letter that the majority of SFO lies on fill material. In addition to your letter, you have provided a map delineating the APE.

Having reviewed this information I can concur that the boundaries of the APE, as depicted on the map provided with your submittal, have been properly determined. However, it would appear you have not fully considered the Vertical APE or the project's potential to affect historic properties. Please continue consultation with me once you have established the extent of ground disturbance and completed your identification efforts. Be advised that under certain circumstances, such as an unanticipated discovery or a change in project description, you may have additional future responsibilities for this undertaking under 36 CFR Part 800.

Thank you for considering historic resources during project planning. I look forward to consulting with you. If you have any questions or comments, please contact Tristan Tozer of my staff at (916) 445-7027, or email at ttozer@parks.ca.gov.

Sincerely,

Susan K Stratton for

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

pew

STATE OF CALIFORNIA – THE NATURAL RESOURCES AGENCY EDMUND G. BROWN, JR., *Governor*

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
1725 23rd Street, Suite 100
SACRAMENTO, CA 95816-7100
(916) 445-7000 Fax: (916) 445-7053
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www.ohp.parks.ca.gov

August 26, 2011

Reply In Reference To: FAA110113A

David Kessler
Environmental Protection Specialist
Federal Aviation Administration
P.O. Box 92007
Los Angeles, CA 90009-2007

RE: Proposed Runway Safety Area Improvement Program, San Francisco International Airport (SFO), San Francisco, San Mateo County, CA

Dear Mr. Kessler:

Thank you for consulting with me on behalf of the Federal Aviation Administration (FAA) in order to comply with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f), as amended, and its implementing regulation at 36 CFR Part 800. You are asking that I concur that the above-referenced undertaking will not affect historic properties.

In our previous round of consultation I concurred that the FAA had adequately delineated the project's Area of Potential Effects (APE). I also requested that the agency renew consultation once identification efforts have been completed. You have since responded to this request, providing the following studies in support of this undertaking:

- *Archaeological Inventory Report: Runway Safety Area Program, San Francisco International Airport, San Francisco County, California* (URS Corporation: June 2011)
- *Historic Architecture Survey Report: Runway Safety Area Program, San Francisco International Airport, San Francisco County, California* (URS Corporation: June 2011)

The *Historic Architecture Survey* includes National Register evaluations of Runways 10L-28R, 10R-28L, 1L-19R, and 1R-19L. The approach lighting trestles for Runways 10L-28R, 10R-28L, and 1R-19L were also evaluated. These runway systems were found ineligible for listing on the National Register of Historic Places because of a lack of integrity due to continuous modification. No other recorded or eligible properties are sited within the APE.

The *Archaeological Inventory Report* summarizes identification efforts undertaken within the APE. According to the Report, the airport was constructed on imported bay fill. The report also notes that most project components requiring excavation will not exceed a depth of five feet below surface level. Project components requiring excavation in excess of five feet below surface level are situated in the vicinity of the south runway end and vary in depth from ten to nineteen feet.

Due to security issues and the active use of the runways, identification efforts were confined to a windshield reconnaissance and limited pedestrian survey of the project area. No archaeological properties were identified. Archival research indicates that no recorded archaeological properties have been recorded within or adjacent to the Direct APE. Three archaeological sites have been identified

within a half-mile of the APE boundary. These sites include a shellmound, a prehistoric shell midden, and a historic debris scatter.

Having reviewed your submittal, I have the following comments:

1) I concur that Runways 10L-28R, 10R-28L, 1L-19R, and 1R-19L and the approach lighting trestles for Runways 10L-28R, 10R-28L, and 1R-19L are ineligible for listing on the NRHP;

2) I further concur that the project, as described in your letter of January 11, 2011, will not affect historic properties;

3) I recommend the presence of an archeological monitor when working in fill predating the 1970s as there is a potential to encounter historic as well as prehistoric cultural artifacts in earlier bay fill;

4) Please be aware that while discoveries in fill may be in disturbed contexts, they may still contain significant information potential as well as significance for other reasons.

Thank you for considering historic resources during project planning. Please be reminded that in the event of an unanticipated discovery or a change in project description, you may have additional responsibilities under 36 CFR Part 800. If you have any questions or comments, please contact Tristan Tozer of my staff at (916) 445-7027, or email at ttozer@parks.ca.gov.

Sincerely,

Susan K Stratton for

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

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AUG 29 2011

Federal Aviation Administration
Western-Pacific Region
Airports Division - AWP-600

APPENDIX E
BIOLOGICAL RESOURCES

Appendix E1
Biological Assessment

BIOLOGICAL ASSESSMENT

SAN FRANCISCO INTERNATIONAL AIRPORT RUNWAY SAFETY AREA PROJECT

Submitted to:

San Francisco International Airport
Bureau of Planning and Environmental Affairs
P.O. Box 8097
San Francisco, California 94128

and

Federal Aviation Administration
Airports Division, Western-Pacific Region
P.O. Box 92007
Los Angeles, California 90009-2007

Prepared by:

LSA Associates, Inc.
20 Executive Park, Suite 200
Irvine, California 92614-4731
(949) 553-0666

LSA Project No. SFI0901

LSA

May 17, 2011

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EXECUTIVE SUMMARY

Project Description. The City and County of San Francisco (CCSF), as owner and operator of San Francisco International Airport (SFO or the Airport) proposes to construct various improvements to the runway safety areas (RSAs) of Runway 10L-28R, 10R-28L, 1R-19L, and 1L-19R to enhance safety at SFO. The Proposed Action is intended to meet *The Transportation, Treasury, Housing and Urban Development, the Judiciary, the District of Columbia, and Independent Agencies Appropriations Act, 2006,*[1] which states the following: "not later than December 31, 2015, the owner or operator of an airport certificated under 49 U.S.C. 44706 shall improve the airport's Runway Safety Areas (RSA) to comply with the Federal Aviation Administration (FAA) design standards required by 14 Code of Federal Regulations (CFR) Part 139." An RSA is a cleared and graded surface area around a runway needed for an aircraft to safely overshoot, undershoot or otherwise veer off a runway. The proposed SFO Runway Safety Area Project (Proposed Action) will modify Runways 1L-19R, 1R-19L, 10L-28R, and 10R-28L to meet current RSA standards to the maximum extent practicable under existing site constraints. Modifications under the Proposed Action will entail minor relocations (shifting) of runways and taxiways combined with the placement of specialized energy-absorbing light concrete beds (Engineered Materials Arresting System [EMAS]) at the ends of the runways.

This Biological Assessment (BA) has been prepared to address the potential effects of the Proposed Action on federally listed threatened or endangered species and designated or proposed critical habitat. The proposed RSA Program includes the following general actions including pile driving work in San Francisco Bay (SF Bay) associated with modifications to the existing wooden trestles supporting the approach lighting systems, as well as relocation of a vehicle service road (VSR) and replacement of stormwater drainage outfall pipes. Construction activities on the impervious/managed areas of the airfield (e.g., installation of EMAS, demolition of existing structures, new underground drainage installations) will have no effects on listed species since none are known to use these portions of the airfield.

The proposed RSA improvements under the Proposed Action would enhance the safety of the RSAs at SFO and would improve compliance with current FAA airport design standards, to the extent practicable, as required by Public Law 109-115.

Purpose of this Biological Assessment. The purpose of this document is to review and analyze the Proposed Action in sufficient detail to determine the extent to which the Proposed Action may affect federally threatened or endangered species and designated or proposed critical habitats protected under the Federal Endangered Species Act (FESA) of 1973. The following federally listed species have the potential to be adversely affected by the Proposed Action without incorporation of appropriate avoidance, minimization, and minimization measures: green sturgeon (*Acipenser medirostris*; federally threatened), Sacramento River winter-run Chinook salmon (*Oncorhynchus*

[1] Public Law 109-115, November 30, 2005 [119STAT. 2401]

tshawytscha; federally endangered), Central Valley spring-run Chinook salmon (federally threatened), central California coast steelhead (*Oncorhynchus mykiss*; federally threatened), and California clapper rail (*Rallus longirostris obsoletus*; federally endangered). In addition to compliance with provisions of the FESA, Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires federal agencies to consult with the National Marine Fisheries Service (NMFS) regarding any action or proposed action that may adversely affect Essential Fish Habitat (EFH) for federally managed fish species. As such, this BA will also address potential effects of the Proposed Action on EFH.

Proposed Action Effects and Proposed Avoidance and Minimization Measures. The Proposed Action has the potential to adversely affect four federally listed fish species (see above), as well as EFH for native species covered under the Pacific Groundfish Fishery Management Plan (FMP), Coastal Pelagic Species FMP, and Pacific Salmon FMP. Although the Proposed Action will not result in any permanent impacts to federally listed fish species and EFH, potential temporary adverse effects could result from pile driving activities (e.g., elevated underwater sound pressure levels, short-term increases in turbidity) associated with modifications to the approach light systems located on pile-supported trestles in the SF Bay. These temporary, construction-related effects to listed fish and EFH will be avoided and/or minimized through implementation of a variety of avoidance and minimization measures (e.g., seasonal work restrictions, installing silt curtains around the work areas, and driving piles during low tides) as well as other general construction protection measures.

The Proposed Action has the potential to adversely affect California clapper rail, which is known to occur in the tidal marsh along the southeastern edge of SFO. Direct effects include the permanent loss of 0.04 acre (ac) (0.02 hectare [ha]) of suitable clapper rail habitat (tidal marsh) due to the proposed VSR relocation southeast of Runway 1R. Other potential effects include temporary construction-related disturbance from construction activities in and adjacent to the marsh associated with the VSR relocation and replacement of existing outfall pipes nearby. To compensate for the 0.04 ac (0.02 ha) of direct impacts to clapper rail habitat, SFO will purchase (prior to construction) and apply 0.20 ac (0.08 ha) of agency-recognized constructed tidal wetland mitigation habitat from the Deepwater Slough Island Wetland Mitigation Project in Redwood City, California, as in-kind mitigation. This acreage represents a mitigation ratio of 5:1 (created tidal wetland acreage : impacted acreage). The Proposed Action will also implement a variety of avoidance and minimization measures to minimize construction-related disturbance to clapper rails, including seasonal work restrictions, biological monitoring, environmental awareness training, installation of a silt fence around the work area perimeter, and avoidance of high-tide periods during construction.

Conclusions. After reviewing the current status of these species, the effects of the Proposed Action, and built-in measures proposed to avoid, minimize and compensate for effects to listed species, the FAA has determined that the Proposed Action: (1) *may affect, but is not likely to adversely affect* anadromous fish (green sturgeon, Chinook salmon, and/or steelhead); (2) *is likely to adversely affect* California clapper rail; and (3) would have *no effect* on salt marsh harvest mouse (*Reithrodontomys raviventris*

Table 1: Summary of Project Effects and Proposed Avoidance and Minimization Measures

Proposed Action Component	Impacted Jurisdictional Feature	Type of Feature	Potential Impacts to Federally Listed Species	Area	Proposed Mitigation (created:filled)
Runway 1R shift, EMAS, and Taxiway A Realignment	South Oxidation Pond[1]	Seasonal Wetland	None	2.41 ac (0.98 ha)	2:1 (Various wetland mitigation projects)
Runway 1R shift, EMAS, and Taxiway A Realignment	Bird Ball Ditch[1]	Other waters of the United States	None	0.36 ac (0.15 ha)	2:1 (Various wetland mitigation projects)
Runway 1R shift, EMAS, outfall pipes, and vehicle service road realignment	Tidal Marsh Southeast of Runway 1R[1]	Tidal Salt Marsh	California clapper rail	0.04 ac (0.02 ha)	5:1 (Deepwater Slough Island Wetland Mitigation Project) and Built-In Construction Mitigation measures
Runway 1R shift, EMAS, and vehicle service road realignment	Millbrae Highline Canal	Other waters of the United States	None	0.37 ac (0.15 ha)	2:1 (Various wetland mitigation projects)
RSA design standards for Runway 28R	Topographic Depression Between Runways 28L and 28R	Seasonal Wetland	None	0.54 ac (0.22 ha)	2:1 (Various wetland mitigation projects)
Approach light system and trestle structures	San Francisco Bay	Other waters of the United States	Various Federally Listed Fish	0.00 ac (0.00 ha)	Built-In Construction Mitigation measures
			Proposed Action Total	3.72 ac (1.51 ha)	

Source: LSA Associates, Inc. 2010a

Note: See Section 6.0 of the Biological Assessment for discussion on effects of the Proposed Action and the associated mitigation.

[1] Previously verified by the Corps with no change in currently mapped jurisdictional boundary.

Corps = United States Army Corps of Engineers

ac = acre/acres

EMAS = Engineered Materials Arresting System

ha = hectare/hectares

raviventris). Furthermore, the Proposed Action <u>*may affect, but is not likely to adversely affect*</u> critical habitat for green sturgeon and steelhead, and <u>*may affect, but is not likely to adversely affect*</u> EFH for federally managed fish species in SF Bay waters adjacent to SFO.

With implementation of the avoidance, minimization and compensation measures identified in this BA which are formally part of the project description, the Proposed Action is not expected to directly or indirectly reduce, in any appreciable manner, the likelihood of survival or recovery of California clapper rail by reducing their reproduction, numbers, or distribution. The measures proposed to offset anticipated effects provide reasonable protections to minimize adverse effects of the Proposed Action. The proposed avoidance and minimization measures will reduce losses of habitat for California clapper rail and the proposed compensation measure (i.e., Deepwater Slough constructed wetland acreage) would result in a net overall improvement in habitat conditions for California clapper rail populations in the region.

1.0 INTRODUCTION

1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

The purpose of this Biological Assessment (BA) is to review and analyze the proposed San Francisco International Airport (SFO) Runway Safety Area (RSA) Project (Proposed Action) in sufficient detail to determine the extent to which the Proposed Action may affect federally threatened or endangered species and designated or proposed critical habitats protected under the Federal Endangered Species Act (FESA) of 1973. This BA has been prepared for use by the Federal Aviation Administration (FAA) to facilitate consultation with the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), pursuant to Section 7 of the FESA. This BA is prepared in accordance with legal requirements set forth under regulations implementing Section 7 of the Endangered Species Act (50 Code of Federal Regulations [CFR] 402; 16 United States Code [U.S.C.] 1536 (c)).

In addition to compliance with provisions of the FESA, Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act [1] (Magnuson-Stevens Act) requires federal agencies to consult with the NMFS regarding any action or proposed action that may adversely affect Essential Fish Habitat (EFH) for federally managed fish species. All native San Francisco Bay (SF Bay) fish species are federally managed under the Magnuson-Stevens Act, and the SF Bay waters surrounding SFO are considered EFH for fish species covered under the Pacific Groundfish Fishery Management Plan (FMP), Coastal Pelagic Species FMP, and Pacific Salmon FMP. As such, this BA will also address potential effects of the Proposed Action on EFH.

1.1.1 Federally Threatened and Endangered Species

The primary federally listed species addressed in this BA consist of the following:

- Green sturgeon (*Acipenser medirostris*) – federally threatened
- Chinook salmon (*Oncorhynchus tshawytscha*), Sacramento River winter-run evolutionarily significant unit (ESU) – federally endangered
- Chinook salmon, Central Valley spring-run ESU – federally threatened
- Steelhead (*Oncorhynchus mykiss*), central California coast ESU – federally threatened
- Salt marsh harvest mouse (*Reithrodontomys raviventris raviventris*) – federally endangered
- California clapper rail (*Rallus longirostris obsoletus*) – federally endangered

Section 2.0 contains a more detailed discussion of federally listed species considered during preparation of this BA.

[1] Public Law 94-265.

1.1.2 Critical Habitat

The USFWS and NMFS are required under Section 4 of the FESA to designate critical habitat for federally listed species. Critical habitat has been designated by NMFS for the following federally listed fish species evaluated in this BA:

- Green sturgeon
- Chinook salmon Sacramento River winter-run evolutionarily significant unit (ESU)
- Chinook salmon, Central Valley spring-run ESU
- Steelhead, central California coast ESU

Although critical habitat has been designated for each of the federally listed species above, the critical habitat designations for green sturgeon and steelhead are the only designations that include the SF Bay waters adjacent to SFO. Critical habitat has not been designated by USFWS for salt marsh harvest mouse or California clapper rail. Section 4.0 of this BA contains a more detailed discussion of critical habitat and potential effects of the Proposed Action on critical habitat for these two species.

1.2 PROPOSED ACTION

The City and County of San Francisco (CCSF), as owner and operator of the SFO, proposes to implement the RSA Program, which involves improving the existing RSAs of all four runways at SFO to enhance safety. This effort is being undertaken by CCSF in response to the requirements of *The Transportation, Treasury, Housing and Urban Development, the Judiciary, the District of Columbia, and Independent Agencies Appropriations Act, 2006,* which requires completion of RSA improvements by airport sponsors that hold an airport operating certificate under Title 14 CFR Part 139,[1] to meet FAA airport design standards by December 31, 2015 (Public Law [P.L.] 109-115, November 30, 2005 [119STAT. 2401]). The applicable airport design requirements are included in FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, and FAA Order 5200.8, *Runway Safety Area Program.*[2] The Proposed Action is based on the preferred alternatives from the RSA studies completed in August 2010 and is described below in Section 1.2.2.

1.2.1 Project Background

RSAs are cleared and graded areas around the entire length of runways, free of objects and structures, that enhance safety in the event of aircraft undershoots, overruns, or veers off the runway. RSAs provide greater accessibility for firefighting and rescue equipment during such incidents and should be drained by grading or storm sewers to prevent water accumulation. For an airport serving the types of aircraft commonly using SFO, FAA Advisory Circular 150/5300-13, *Airport Design*,

---

1 Under 14 CFR Part 139, airports that provide commercial service must meet safety and operational standards in order to operate as a public use airport. FAA issues Airport Operating Certificates to those airports that pass FAA inspections of airport safety, design, and operations.

2 United States Department of Transportation, Federal Aviation Administration. Order 5800.9, *Runway Safety Area Program*. October 1, 1999. This Order describes the procedures that FAA employees will follow in implementing the RSA Program, such as taking inventory of RSA status at all 14 CFR Part 139 certificated airports, issuance of RSA determinations, and implementation of RSA improvements.

establishes the following standard RSA dimensions: 500 feet (ft) (152 meters [m]) wide by 600 ft (182 m) long prior to each landing threshold to accommodate aircraft undershooting the runway, and 500 ft (152 m) wide by 1,000 ft (304 m) beyond each runway end to accommodate aircraft overshooting the runway. Because all runways at SFO can be used in either direction depending on wind conditions, the 1,000 ft (304 m) RSA extending from both ends of each runway is applicable.

An inventory of existing RSA conditions at SFO was collected from data in previous studies, drawings from the Airport Layout Plan, and available survey information. RSA deficiencies were quantified to the extent they do not meet the FAA's RSA standards (Ricondo and Associates, Inc., 2010a and 2010b). The reasons for these RSA deficiencies were determined to be primarily associated with constraints imposed by existing service roads, sea walls, and some navigational aids, as well as limits due to SF Bay. The dimensions and key deficiencies of the existing RSAs at SFO are summarized in Table A.

Table A: Summary of Existing Runway Safety Area Conditions at San Francisco International Airport (Runways 1L-19R, 1R-19L, 10L-28R, and 10R-28L)

Runway End[1]	RSA Available Length from Runway End[2]	Meets FAA Standards?	Deficiency
1L	609 ft (185 m)	No	391 ft (119 m)
1R	777 ft (236 m)	No	223 ft (67 m)
19L	246 ft (74 m)	No	754 ft (229 m)
19R	177 ft (53 m)	No	823 ft (250 m)
10L	1,000 ft (304 m)	Yes[3]	N/A
10R	1,000 ft (304 m)	Yes[3]	N/A
28L	324 ft (98 m)	No	676 ft (206 m)
28R	322 ft (98 m)	No	678 ft (206 m)

1 There are four runways at SFO (Runways 1L-19R, 1R-19L, 10L-28R, and 10R-28L) for a total of eight runway ends.
2 All RSAs at SFO are 500 ft wide, centered along the runway centerline. A 500 ft wide RSA complies with the width dimensions required in FAA AC 150/5300-13, *Airport Design*.
3 Runways 10L and 10R are currently substandard RSAs due to existing navigational aids that are made out of nonfrangible materials and are located within the RSAs.
AC = Advisory Circular
FAA = Federal Aviation Administration
ft = foot/feet
m = meter/meters
N/A = not applicable
RSA = Runway Safety Area
SFO = San Francisco International Airport

RSA studies were completed for SFO in August 2010 to identify and evaluate alternatives for bringing the RSAs into conformance with criteria specified in FAA AC 150/5300-13 (Ricondo and Associates, Inc., 2010a and 2010b). To ensure the needs of various airport users were considered, SFO established an RSA Study Working Group to provide input and evaluate the recommended practicable RSA alternatives considered in the RSA studies. The RSA Study Working Group was made up of representatives from various divisions within SFO, FAA, and airlines operating at the Airport. The final proposed improvements involve a combination of runway shifts and other improvements.

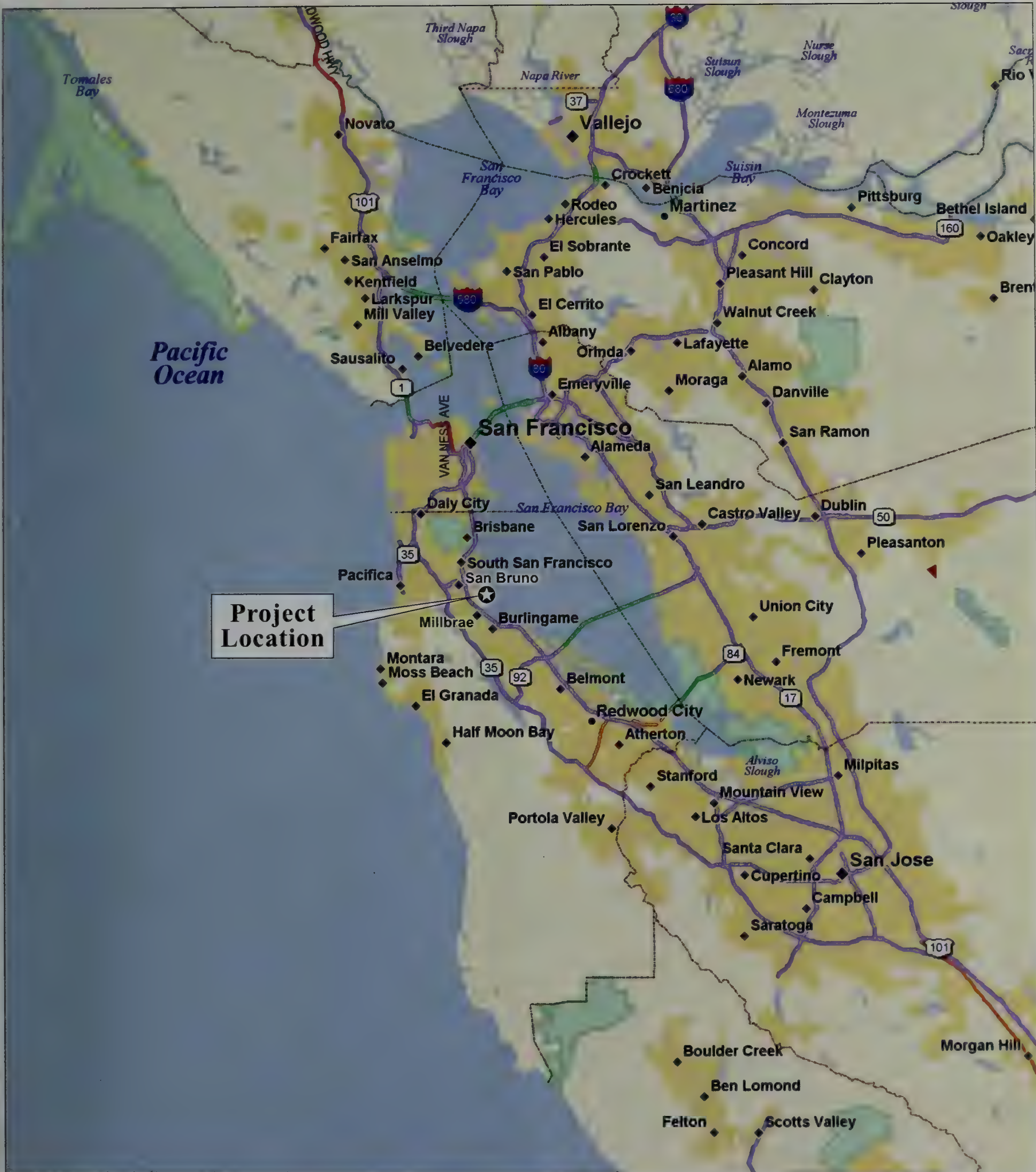
1.2.2 Project Description

SFO is located in an unincorporated part of San Mateo County, about 13 miles (mi) (20 kilometers [km]) south of downtown San Francisco, east of Highway 101 near the cities of South San Francisco, San Bruno, and Millbrae. Figure 1 shows the regional location of SFO, and Figure 2 depicts SFO. The majority of construction activities will occur at the four runways (or eight runway ends): Runways 1L-19R, 1R-19L, 10L-28R, and 10R-28L. All Proposed Action components are located on existing SFO property. A general overview of the airfield runway layout and locations of proposed activities, and the action area, are depicted on Figure 3.

The RSA Study Working Group determined that it is not practicable to create RSAs for Runways 1L-19R and 1R-19L that meet the applicable standards because of the position of the runways relative to the SF Bay and Highway 101. An Engineered Materials Arresting System (EMAS) is proposed to be installed at these runway ends to enhance safety of the RSAs. An EMAS is a specialized system made of high-energy-absorbing materials that is installed in the RSA beyond the runway end. When an aircraft overruns the runway, these materials are crushed by the landing gear, absorbing the forward momentum of the aircraft and decelerating and arresting the aircraft's movement Photographs of EMAS installations at other airports in the U.S. are presented in Figure 4. SFO is proposing to install a nonstandard EMAS to enhance safety while minimizing potential environmental effects. The final dimensions of the EMAS beds to be installed will be determined by an engineering analysis during project design.

The Proposed Action also includes the use of "declared distances" for several of the runways. Declared distances are defined in Chapter 1 of FAA AC 150/5300-13. They involve the designation of specific lengths of runway pavement that are available for use by pilots in planning takeoffs or landings using that runway, considering the capabilities of their aircraft for safe operations, the Operations Specifications of the aircraft operator approved by the FAA under 14 CFR Part 119, or the operational standards of the aircraft operator. These designations allow remaining portions of the runway pavement to be designated as part of the RSA. Declared distances proposed as part of the RSA Program include Takeoff Run Available, Takeoff Distance Available, Accelerate Stop Distance Available, and Landing Distance Available.

The overall RSA project also includes a number of related construction components, such as relocation/demolition of existing structures, new underground drainage installations and pump stations, relocation of runway/taxiway lights and signage, and relocation of an electrical substation. Most of the construction work associated with the Proposed Action will occur on impervious/managed areas of the airfield that do not have any FESA considerations. Accordingly, as analyzed further in this document, this BA focuses on work in the SF Bay (runway approach light station relocation) and along the edge of the tidal marsh south of the airfield (utility and vehicle service road [VSR] improvements). Figure 5 presents a plan view of the proposed VSR relocation and outfall replacement work areas. Figure 6 provides site photographs of the work areas.



LSA

FIGURE 1

County Boundary

MILES

SOURCE: ©2006 DeLORME. STREET ATLAS USA®2006.

San Francisco International Airport
Runway Safety Area Project

Regional Location

P:\SFI0901\g\RSA\Figures\BA\Figure1_RegionalLocation.cdr (02/24/2011)

LSA

FIGURE 2

0 1500 3000
FEET

SOURCE: USGS 7.5-minute Topographic Quads - San Francisco South (1980), Hunters Point (1980), Montara Mountain (1980) and San Mateo (1980).

I:\SFI0901\GIS\Maps\BA\Figure2_Project Site Location.mxd (11/16/2010)

San Francisco International Airport
Runway Safety Area Project

Project Site Location

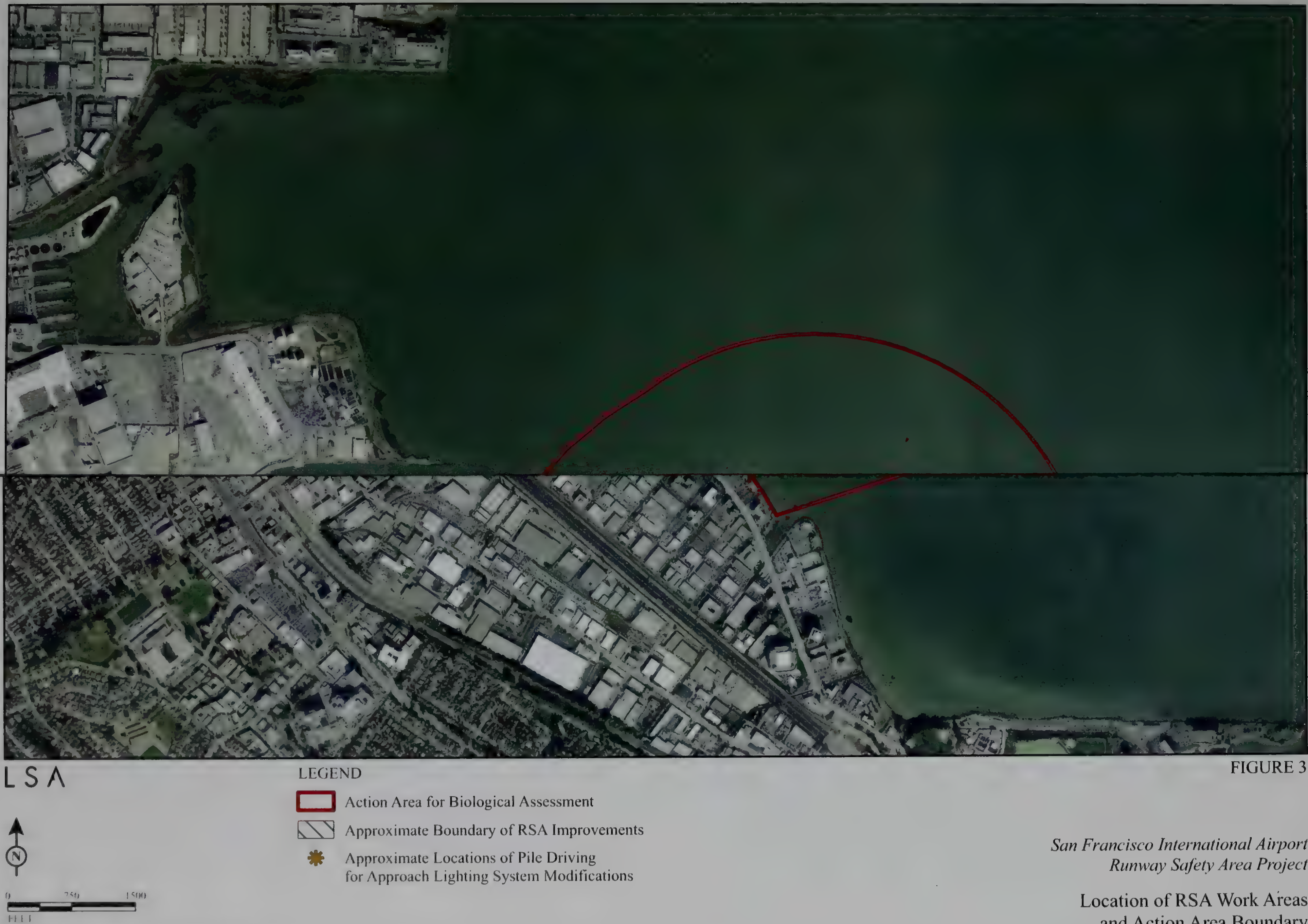


FIGURE 3

San Francisco International Airport
Runway Safety Area Project

Location of RSA Work Areas
and Action Area Boundary

SOURCE: Aerial Imagery from USGS (05/2009)

I:\SFI0901\GIS\Maps\BA\Figure3_Work Areas and Action Area.mxd (5/11/2011)

FIGURE 3

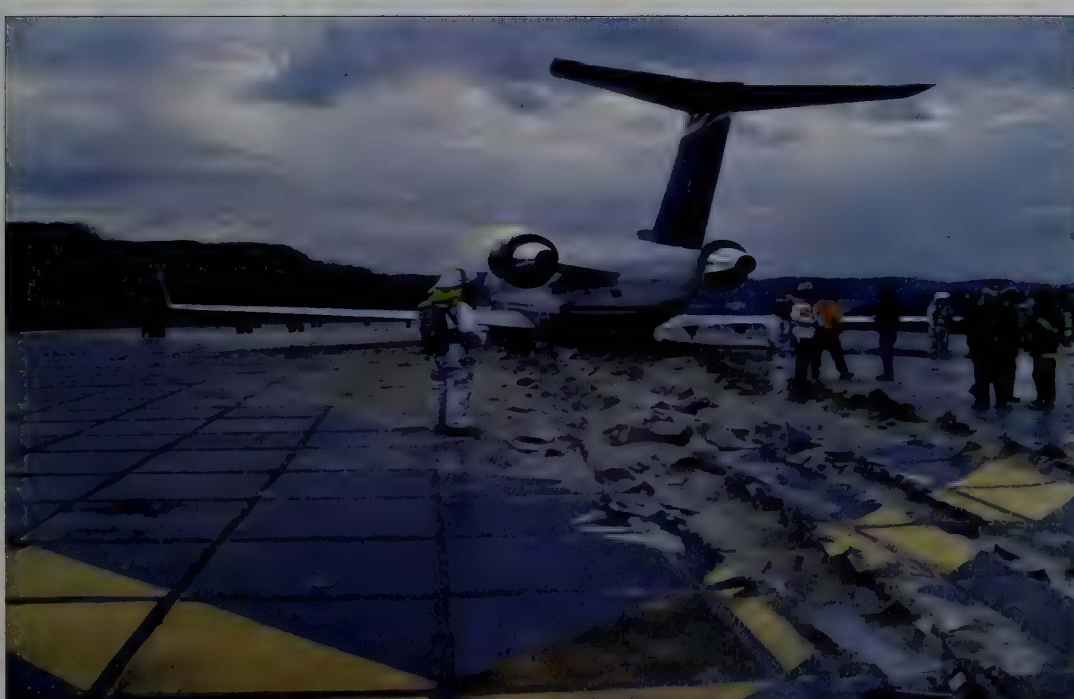
San Francisco International Airport
Runway Safety Area Project

Location of RSA Work Areas
and Action Area Boundary

SOURCE: Aerial Imagery from USGS (05/2009)

I:\SFI0901\GIS\Maps\BA Figure3_Work Areas and Action Area.mxd (5/31/2011)

Photograph #1. Typical view of installed/intact EMAS bed.



Photograph #2. View of EMAS bed following aborted takeoff at Yeager Airport, Charleston, West Virginia. January 2010.

LSA

FIGURE 4

San Francisco International Airport
Runway Safety Area Project

Source of Photographs: Engineered Arresting Systems Corporation

EMAS Photographs

P:\SFI0901\g\RSA\Figures\BA\Figure4_EMASPhotographs.cdr (02/11/2010)

LSA

FIGURE 5

LEGEND

- Wetland Boundary (Limit of Tidal Marsh)
- Permanent Impacts to Tidal Marsh Wetlands/ Clapper Rail Habitat from Vehicle Service Road (VSR) Fill (0.04 acre)
- Uplands to be Graded/Paved for VSR Relocation
- Construct New Sheet-pile Seawall
- Existing Sheet-pile Seawall (to remain)
- Existing Sheet-pile Seawall to be Removed

0 30 60
FEET

San Francisco International Airport
Runway Safety Area Project

Proposed Vehicle Service Road Relocation and Outfall Replacement Work Areas

SOURCE: Aerial Imagery from USGS (05/2009).

I:\SFI0901\GIS\Maps\BA\Figure5_VSR and Outfall Work Areas.mxd (4/18/2011)

Photograph #1. View of tidal marsh/upland edge (in background) to be filled for Vehicle Service Road (VSR) realignment. Realigned VSR to extend along existing sheet-pile seawall. View of existing stormwater outfall pipes to be replaced with new pipes. Existing timber trestle to be used.

Photograph #2. View of northern portion of Bird Ball Ditch. View facing southeast.

LSA

FIGURE 6

San Francisco International Airport
Runway Safety Area Project

Site Photographs - Vehicle Service Road Relocation/
Outfall Replacement Work Areas and Bird Ball Ditch

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The primary components of the RSA enhancements associated with the Proposed Action are described below, by runway end:

- **Runway Shifts and Declared Distances:**
  - Shift Runway 1L-19R by about 450 ft (137 m) to the south by extending the runway pavement at the south end of the runway by about 450 ft (137 m) and reducing the north end of the runway by a similar distance, thus providing a 600 ft (182 m) RSA prior to the Runway 19R landing threshold while maintaining the existing runway length. The shift would allow RSA enhancements entirely on SFO property and without fill of the SF Bay.
  - Shift Runway 1R-19L by about 200 ft (60 m) to the south by extending the runway pavement at the south end of the runway by about 200 ft (60 m) and reducing the north end of the runway by a similar distance, while maintaining the existing runway length. The shift would allow RSA enhancements entirely on SFO property and without fill of the SF Bay.
  - Implement declared distances on Runways 1L-19R, 1R-19L, 10L-28R, and 10R-28L.
- **South End – Runways 1L and 1R (see Figure 7):**
  - Install a nonstandard EMAS bed (about 500 ft [152 m] long and 220 ft [67 m] wide) south of Runway 1L, with a 35 ft (10 m) setback from the runway end.
  - Install a nonstandard EMAS bed (about 380 ft [116 m] long and 220 ft [67 m] wide) south of Runway 1R, with a 35 ft (10 m) setback from the runway end.
  - Demolish portions of the existing Taxiway A and A1[1] pavement and construct a realigned Taxiway A extending between Taxiway B and Taxiway L around the south side of the new EMAS installations at the south end of the runways.
  - Construct a new taxiway between Taxiway B, Runway 1L threshold, Runway 1R threshold, and Taxiway L, with a midfield connection to the relocated Taxiway A.
  - Fill the South Detention Basin,[2] located south of Runway 1L, for EMAS installation.
  - Install new underground stormwater pipes aligned around the EMAS beds and Runways 1L and 1R. Stormwater would be directed to a new stormwater detention basin and pumped to the Mel Leong Treatment Plant for first flush treatment.
  - Replace stormwater drainage outfall pipes with larger-diameter pipes in their existing location. Two of the new pipes will be 36 inches (in.) (91 centimeters [cm]) in diameter; the remaining four pipes will be replaced in-kind: two will be 30 in. (76 cm) in diameter, and one will be 18 in. (45 cm) in diameter. The existing timber trestle will be used to support the new outfall pipes. Up to 18 new timber blocks will be added to the trestle structure to facilitate outfall pipe installation. No additional pile driving, pile removal, or fill will be conducted as part of the stormwater outfall pipe replacement activities.

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1 Taxiways A and A1 are connector taxiways that provide entry and exit points for an aircraft along the runway length. Connector taxiways are generally shorter than full-length parallel taxiways.

2 The South Detention Basin is a non-jurisdictional, concrete-lined water feature, as confirmed by the United States Army Corps of Engineers (Corps) in 1999 for the SFO Consolidated Wetland Fill Project.

LSA

FIGURE 7

LEGEND

- Non-jurisdictional Area
- Jurisdictional Area
- Tidal Marsh Jurisdictional Boundary
- Relocated Blast Fence
- Relocated Vehicle Service Road
- EMAS
- New Runway Pavement
- New Taxiway
- Other New Asphalt/Concrete
- Taxiway Demolished

0 250 500
FEET

San Francisco International Airport
Runway Safety Area Project

Proposed Project - Alternative 6A
Runways 1L and 1R

SOURCE: URS Corp. (2010); Aerial Imagery from USGS (2008).

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- Realign the following features due to the EMAS installation to maintain the minimal safety distance outside of the taxiway object free area: (1) VSR, (2) aircraft blast fence, and (3) airport operations area[1] security fence. The proposed VSR realignment will require the fill of 0.04 ac (0.02 ha) of tidal marsh to accommodate an approximately 250 ft (76 m) segment of the new 20 ft (6 m) wide roadway south of Runway 1R (see Figure 5).
- Relocate the electrical substation to maintain the minimal safety distance outside of the taxiway object free area.

* **East End – Runways 28L and 28R (see Figure 8):**
  - Displace the landing thresholds for Runways 28L and 28R by 300 ft to the west to provide 600 ft (182 m) of RSA prior to the landing thresholds.
  - Relocate associated navigational aids, such as the glide slope antenna and the localizer antenna for Runways 28L and 28R, located on the airfield to accommodate the landing threshold displacement.
  - Relocate portions of the approach light system for Runways 28L and 28R to accommodate the relocated landing threshold. Similar to Runway 19L, the approach light system for Runways 28L and 28R are also mounted on pile-supported wooden trestle structures in SF Bay. Displacing the threshold by 300 ft (91 m) would minimize the need to relocate the approach light system and structures that are spaced at intervals of 100 ft (30 m), consistent with FAA design criteria for Category II/III Instrument Landing Systems[2]. As a result of the spacing, two approach light stations and associated wooden structures with side bars would be relocated by 300 ft (91 m) for this runway. This work would involve the installation of a total of ten new 20-inch-diameter timber pilings in the SF Bay. All new pilings will be chemically-treated and wrapped with an impact-resistant, biologically inert material to prevent deterioration.[3]
  - The 500 ft (152 m) wide RSA at the approach end of Runway 28R includes a seasonal wetland/depressional ponding area that will be filled in accordance with FAA AC 150/5300-13, which requires that RSAs be level and free of obstructions, including areas that retain water. The seasonal wetland/ponding area is approximately 0.54 ac (0.22 ha) in size and is located approximately 50 ft (15 m) from the edge of Runway 28R.

* **North End – Runways 19R and 19L (see Figure 9):**
  - Install a nonstandard EMAS bed (about 550 ft [167 m] long and 220 ft [67 m] wide) north of the Runway 19R threshold, with a 50 ft (15 m) setback from the runway end.
  - Install a nonstandard EMAS bed (about 410 ft [124 m] long and 220 ft [67 m] wide) north of the Runway 19L threshold, with a 35 ft (10 m) setback from the runway end.

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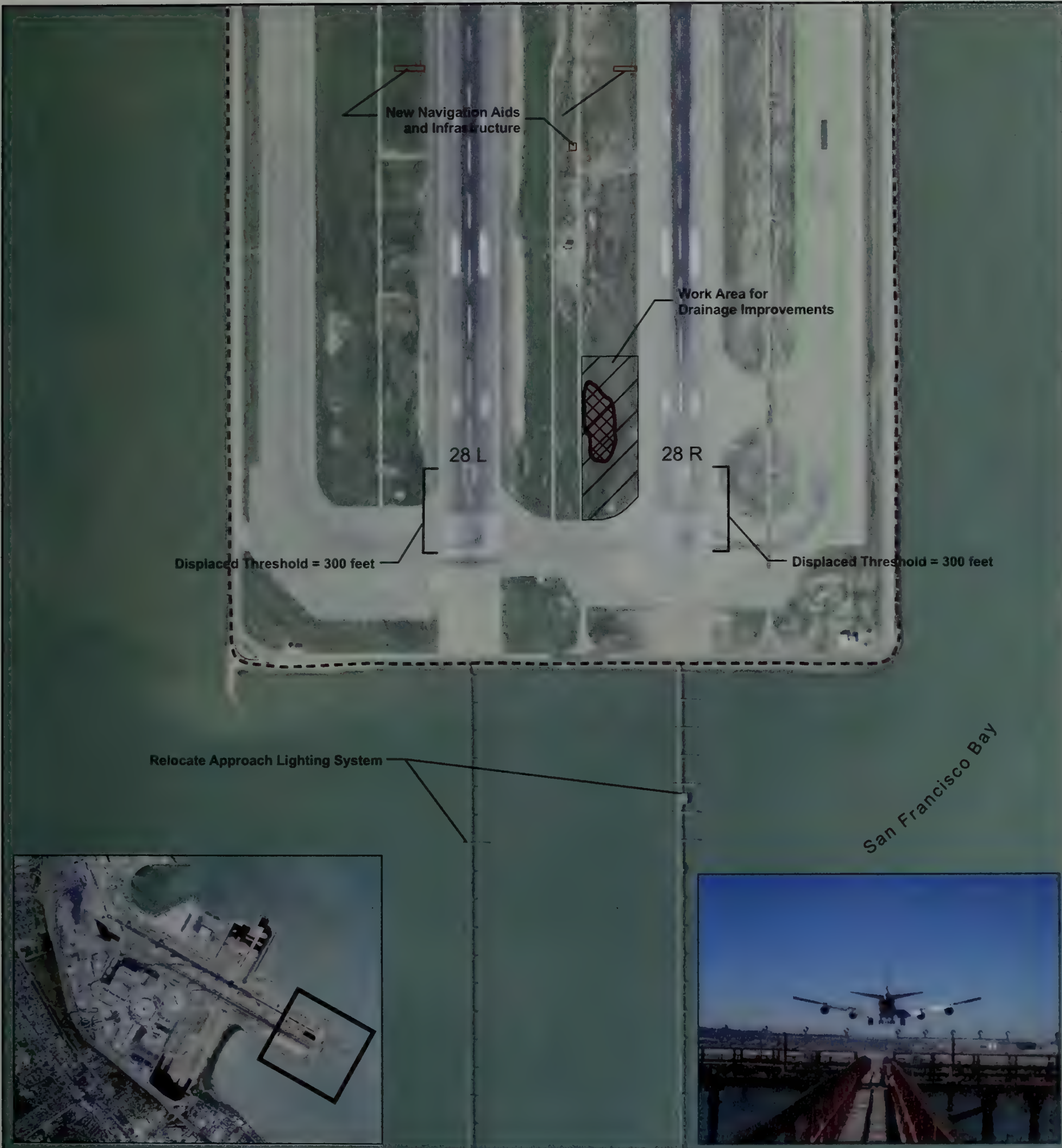
[1] An airfield operations area (AOA) includes all the areas inside the airport perimeter fence, which are restricted security access areas. An AOA also includes all the areas located outside the airport terminal buildings on the airfield, including runways, taxiways, ramps, hardstands, VSRs, and cargo areas.

[2] Runways 28L and 28R have precision instrument approach lights that allow for landings under poor visibility conditions. The type of a runway approach category dictates the design for the spacing of the approach lights. For Category II and III approaches, the lights are spaced at 100 ft. For Category I (such as Runway 19L), the lights are spaced at 200 ft.

[3] The unused wooden trestles/pilings may be left in their current location to facilitate future modifications to approach light systems. All existing trestle structure pilings are chemically-treated and wrapped with an impact-resistant, biologically inert material.



LSA

LEGEND

- - - High Tide Line

Seasonal Wetland/Ponding Area to be Filled to Meet RSA Requirements

FIGURE 8

0 250 500
FEET

San Francisco International Airport
Runway Safety Area Project

Proposed Project - Alternative 6A
Runways 28L and 28R

SOURCE: URS Corp. (2010); Aerial Imagery from USGS (2008); Inset Photo - FAA, October 2010.

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LSA

LEGEND

- - - High Tide Line
EMAS
New Taxiway
Other New Asphalt/Concrete
Taxiway Demolished

0 250 500
FEET

FIGURE 9

San Francisco International Airport
Runway Safety Area Project

Proposed Project - Alternative 6A
Runways 19L and 19R

SOURCE: URS Corp. (2010); Aerial Imagery from USGS (2008); Inset Photo - SFO, February 2009.

I:\SFI0901\GIS\Maps\BA\Figure9_Proposed Project_19L&19R.mxd (5/16/2011)

- Decommission (remove taxiway lights and paint) and realign portions of existing Taxiway E and L, serving the north ends of the runways (Runways 19R and 19L) to the relocated runway threshold.
- Relocate portions of the approach light system for Runway 19L to accommodate the relocated landing threshold. The approach light system is mounted on timber pile-supported trestle structures in the SF Bay and spaced at intervals of 200 ft (60 m), consistent with FAA design criteria for category I approach light systems. Displacing the threshold by 200 ft (60 m) on Runway 19L would minimize the need to relocate the entire approach light system and structures in the SF Bay that are spaced at intervals of 200 ft (60 m). Modifying/extending the trestle structure for Runway 19L would involve the installation of a total of 20 new 20-inch-diameter timber pilings in the SF Bay. All new pilings will be chemically-treated and wrapped with an impact-resistant, biologically inert material to prevent deterioration. The unused wooden trestles/pilings may be left in their current location to facilitate future modifications to approach light systems; all existing pilings are chemically-treated and wrapped. Figure 11 shows photographs of the existing trestle structures in the SF Bay, light stations, and piling configuration for the side bars.

- **West End – Runways 10R and 10L (see Figure 10):**
  - Relocate the west end of the Runway 10R-28L pavement by 781 ft (238 m) west to preserve the existing Runway 10R takeoff roll capability and existing runway end stagger, and relocate the existing localizer antenna for arrivals on Runway 28L.
  - Construct a new taxiway connection between Taxiway S, the relocated threshold of Runway 10R, and Taxiway Z.

On February 8, 2011, SFO and FAA met with staff from NMFS and the California Department of Fish and Game (CDFG) to provide an overview of the Proposed Action, potential project impacts, and associated mitigation. During the meeting, NMFS staff requested additional information about the existing and proposed changes to the stormwater drainage system in the south airfield area. The following is a description of the stormwater system in the south airfield area. See Figures 5 through 7 for locations and site photographs of the stormwater basins and outfall pipes.

South Airfield Drainage. The south airfield area is served by two surface detention basins—the South Oxidation Pond and South Detention Basin. The South Detention Basin (non-jurisdictional water feature) provides the primary stormwater collection for the south airfield area. It is a concrete-lined basin located immediately south of Runway 1L. Stormwater collected in the South Detention Basin is diverted to the industrial wastewater collection system for treatment of first flush contaminants at the SFO Mel Leong Treatment Plant–Industrial Wastewater Process (MLTP-IWP). Runoff contained in the South Detention Basin cannot be diverted to SF Bay. Flow from the MLTP-IWP collection system is also not diverted back to the South Detention Basin, except in case of emergency storage usage. The South Oxidation Pond (and a secondary adjacent pond, called the "Bird Ball Ditch") provides additional stormwater capacity to capture excess surface water during extended rain events. Upon capture and treatment of the first flush, stormwater captured during extended rain events may be discharged to receiving waters as it is considered clean. Under the Proposed Action, the stormwater would be captured via underground pipes and other diversion structures to a new concrete-lined underground detention basin. Similar to the existing system, the

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LEGEND

- New Runway Pavement
- New Taxiway
- Other New Asphalt/Concrete

FIGURE 10

0 250 500
FEET

San Francisco International Airport
Runway Safety Area Project

Proposed Project - Alternative 6A
Runways 10L and 10R

SOURCE: URS Corp. (2010); Aerial Imagery from USGS (2008).

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Photograph #3. View of pile-supported trestle for approach lighting system at end of Runway 28L. View facing southeast.

Photograph #4. View of typical light station and piling configuration for trestles at end of Runways 28L and 28R. View facing southeast.

LSA

FIGURE 11

San Francisco International Airport
Runway Safety Area Project

Site Photographs -
Trestle Structure Supporting
Runway Approach Light Systems

new system would continue to pump stormwater to the MLTP-IWP for first flush contaminant treatment; stormwater captured during extended rain events may also be discharged to receiving waters.

While the outfall pipes would be increased in diameter, the design increases the flow through the outfall pipes and uses larger pipes to limit the velocity of the water. The scour force of the water at the outfalls is a function of the height of the pipe relative to the ground. The discharged water would continue to be gravity driven and is dissipated by the existing splash pad below the outfalls. The system would continue to be subject to the State of California Regional Water Quality Control Board (RWQCB) requirements, including best management practices (BMPs), such as regular maintenance, monitoring and cleaning of the system.

1.2.3 Description of the Action Area

For the purposes of this BA, the action area was defined by analyzing the potential extent of effects of the Proposed Action in the context of the existing airport land use, habitat suitability/boundary considerations, and species sensitivity. The action area analyzed herein encompasses a substantial portion of the airfield, including the four runway ends and associated taxiways (excluding the terminal and ramp areas), as well as: (1) all tidal marsh, mudflat, and open water habitat within 700 ft (213 m) of the edge of the airfield southeast of Runway 1R (i.e., location of VSR relocation and outfall pipe replacement work); and (2) all SF Bay waters within 3,281 ft (1,000 meters) of the pile driving work areas (i.e., locations where new pilings will be installed in the SF Bay) at the approach end of Runways 28L, 28R, and 19L to facilitate modifications to the trestles that support the approach light systems (Figure 3).

The tidal marsh, mudflat, and open water habitat within 700 ft (213 m) of the edge of the airfield were included in the action area. This 700 ft (213 m) distance is based on a standard buffer distance considered by the USFWS to be adequate to protect breeding California clapper rails from construction-related effects. This distance was established in the Biological Opinion (BO) for the South Bay Salt Pond Restoration Project (USFWS 2008). The 700 ft (213 m) distance was therefore used for evaluating the potential construction-related effects of the airfield components of the RSA project on California clapper rails. The 700 ft (213 m) distance is included in the larger action area for the Proposed Action, as depicted on Figure 3. Other potential temporary effects, such as those from lighting and vibrations resulting from project construction activities extending beyond 700 ft (213 m) from the action area, are expected to be nonexistent to negligible, especially given the high level of ongoing disturbance from aircraft movements and other operational activities on the airfield.

Determining the action area for in-water pile driving effects on fish is a complex endeavor that requires calculating the distance at which the predicted pile driving sound pressure levels attenuate to a level that is equal to the ambient noise level in all directions (ICF Jones & Stokes and Illingworth and Rodkin, Inc. 2009). In the absence of ambient underwater noise level data for the waters adjacent to SFO and other project-specific predictors of pile driving sound levels, a distance of 3,281 ft (1,000 m) is considered adequate to evaluate Proposed Action effects on fish since predicting audibility (or detectability) with any certainty at distances beyond 1,641 to 3,281 ft (500 to 1,000 m) is not possible. Therefore, "the project action area based on pile driving noise should never be considered to extend more than [3,281 ft, 1,000 m] from the pile driving activity" (ICF Jones & Stokes and Illingworth and Rodkin, Inc. 2009).

2.0 SPECIES CONSIDERED

2.1 LISTED SPECIES POTENTIALLY AFFECTED

LSA searched the California Natural Diversity Database (CNDDB) (CDFG 2010) for known occurrences of federally listed plant and animal species in the project vicinity. Records were assessed for the *Montara Mountain*, *San Mateo*, *Hunters Point*, and *San Francisco South* United States Geological Survey (USGS) 7.5-minute quadrangles. LSA also obtained a species list from the USFWS Sacramento Fish and Wildlife Office (USFWS 2010a) for the same quadrangles. Additional sources of information included the *Proposed SFO Runway Reconfiguration Program Biology Technical Report* (URS 2001) and LSA biologists' knowledge of federally listed species in the area. From these sources, LSA developed a list of 32 federally listed threatened and endangered species that occur or may occur in the vicinity of the Proposed Action. Oceanic species known to occur along the west coast of the San Francisco Peninsula in salt water of the Pacific Ocean (e.g., black abalone, southern sea otter, whales, sea turtles) but not in SF Bay were not included in the list or evaluated. The status, habitat requirements, and potential for occurrence of these species within the project area are summarized in Table B. Section 4.0 analyzes the potential for the Proposed Action to affect these species.

Based on a review of the distribution and habitat requirements of these species and the habitat available at the project site, LSA determined that 26 of the 32 federally listed species (11 plants and 15 animals) are not likely to occur on the project site (see Section 2.2). The analysis concluded six species needed to be evaluated in more detail to determine whether they may be affected by the Proposed Action. These species are green sturgeon, Chinook salmon (Sacramento River winter-run and Central Valley spring-run ESUs, which are considered separate species under the FESA), steelhead (central California coast ESU), salt marsh harvest mouse, and California clapper rail.

This BA has been prepared to address the potential effects of the Proposed Action on these six species as a result of the pile driving work in the SF Bay associated with modifications to the wooden trestles supporting the approach light systems, as well as VSR relocation and outfall pipe replacement activities. Construction activities on the impervious/managed areas of the airfield (e.g., installation of EMAS, demolition of existing structures, new underground drainage installations) will have no effects on listed species since none are known to use those portions of the airfield.

2.2 LISTED SPECIES NOT PRESENT

As discussed above, LSA determined that 27 of the 32 species listed in Table A are not expected to occur in the action area as follows:

Table B: Federally Listed Species Potentially Occurring in the Vicinity of the San Francisco International Airport, San Mateo County, California

Species (Common and Scientific Name)	Status	Habitat	Potential for Occurrence within Action Area
PLANTS			
San Mateo thorn-mint *Acanthomintha duttonii*	Endangered	Serpentine soils of chaparral and grassland in San Mateo County.	**None:** Serpentine soils not present.
Presidio manzanita *Arctostaphylos hookeri* ssp. *ravenii*	Endangered	Open, rocky serpentine slopes in chaparral, coastal prairie, and coastal scrub.	**None:** Rocky, serpentine slopes not present.
Robust spineflower *Chorizanthe robusta* var. *robusta*	Endangered	Sandy terraces and bluffs in woodland, coastal dunes, and coastal scrub.	**None:** Sandy substrates not present.
Fountain thistle *Cirsium fontinale* var. *fontinale*	Endangered	Perpetually moist openings in riparian or serpentine chaparral between 300 to 600 ft (91 to 182 m) in elevation.	**None:** Riparian or serpentine chaparral not present; action area too low in elevation.
San Mateo woolly sunflower *Eriophyllum latilobum*	Endangered	Shaded moist sites on steep grassy or sparsely wooded slopes. Grows particularly well under or adjacent to coast live oaks.	**None:** Known from only two occurrences in San Mateo County (CNPS 2010). Serpentine soils in oak woodland not present.
Marin dwarf-flax (=western flax) *Hesperolinon congestum*	Threatened	Serpentine soils.	**None:** Serpentine soils not present.
Beach layia *Layia carnosa*	Endangered	Coastal sand dunes.	**None:** Coastal sand dunes not present.
San Francisco lessingia *Lessingia germanorum*	Endangered	Old coastal sand deposits in sparse, relatively open dune scrub, coastal scrub, and grassland. Limited to six sites in the Presidio of San Francisco and one site in Daly City.	**None:** Sandy substrates not present. Action area outside known distribution of species.
White-rayed pentachaeta *Pentachaeta bellidiflora*	Endangered	Open dry rocky slopes in grassland, often on slopes derived from serpentine bedrock.	**None:** Rocky, serpentine slopes not present.
Hickmans' potentilla (=cinquefoil) *Potentilla hickmanii*	Endangered	Coastal bluff scrub, closed-cone coniferous forest, meadows and seeps, marshes and swamps.	**None:** Seasonal wetlands on airfield too disturbed to support species.
California seablite *Suaeda californica*	Endangered	Margins of coastal salt marshes.	**None:** Last recorded in SFO vicinity (Bay Farm Island) in 1943 (CDFG 2010). Currently only known to occur in Morro Bay and Cayucos Point in San Luis Obispo County (CNPS 2010). Surveys conducted at Bayfront Park in 2000 did not find this species (URS 2001).
INVERTEBRATES			
San Bruno elfin butterfly *Callophrys mossii bayensis*	Endangered	Coastal scrub in San Mateo County. Colonies located on steep north-facing slopes within fog belt. Dependent on *Sedum spathulifolium* for larval host plant.	**None:** Coastal scrub with *Sedum spathulifolium* not present.
Bay checkerspot butterfly *Euphydryas editha bayensis*	Threatened, Critical Habitat	Native grasslands on serpentine soils in San Francisco Bay area; dependent on host plants *Plantago erecta* (primary), *Castilleja densiflorus*, and *C. exserta*	**None:** Native grasslands with serpentine soils not present.

Table B: Federally Listed Species Potentially Occurring in the Vicinity of the San Francisco International Airport, San Mateo County, California

Species (Common and Scientific Name)	Status	Habitat	Potential for Occurrence within Action Area
Mission blue butterfly *Icarica icarioides missionensis*	Endangered	Coastal grassland and chaparral between 690 and 1,180 ft (210 to 359 m) in elevation. Known colonies range from Fort Baker (Marin County) to Sweeny Ridge (San Mateo County). Larval host plants include *Lupinus albifrons*, *L. formosus*, and *L. variicolor*).	**None:** Coastal grassland and chaparral not present. Action area too low in elevation.
Callippe silverspot butterfly *Speyeria callippe callippe*	Endangered	Grassy hilltops and ridges at San Bruno Mountain and Sign Hill (San Mateo County), in the hills near Pleasanton (Alameda County), at Sears Point (Sonoma County), and in the hills between Vallejo and Cordelia.	**None:** Action area outside known range of species.
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	Endangered	Coastal terrace prairie, coastal bluff scrub, and associated grasslands in western Marin and southwestern Sonoma Counties. Extirpated south of Golden Gate.	**None:** Action area outside known range of species.
		FISH	
Green sturgeon (southern DPS) *Acipenser medirostris*	Threatened, Critical Habitat	Oceanic waters, bays, and estuaries along the west coast of North America.	**Low:** Individuals may occasionally be present in SF Bay waters adjacent to SFO.
Tidewater goby *Eucyclogobius newberryi*	Endangered	Brackish shallow lagoons and lower stream reaches with still, but not stagnant, water.	**None:** Species considered extirpated from SF Bay (Moyle 2002).
Delta smelt *Hypomesus transpacificus*	Threatened	Brackish river channels and tidally influenced backwater sloughs of Sacramento-San Joaquin Delta.	**None:** Action area outside known range of species.
Chinook salmon (Sacramento River winter-run ESU[1]) *Oncorhynchus tshawytscha*	Endangered	**Anadromous:** Spawns in Sacramento River system; occurs in small numbers in Central Bay.	**Low:** Individuals may occasionally be present in SF Bay waters adjacent to SFO.
Chinook salmon (Central Valley spring-run ESU) *Oncorhynchus tshawytscha*	Threatened	**Anadromous:** Spawns in Sacramento River system; occurs in small numbers in Central Bay.	**Low:** Individuals may occasionally be present in SF Bay waters adjacent to SFO.
Steelhead (central California coast ESU) *Oncorhynchus mykiss*	Threatened, Critical Habitat	**Anadromous:** Spawns in coastal streams in fall and winter; occurs in small numbers in Central Bay.	**Moderate:** Species likely occurs intermittently in Bay waters adjacent to SFO.
Steelhead (Central Valley ESU) *Oncorhynchus mykiss*	Threatened	Sacramento and San Joaquin Rivers and their tributaries.	**None:** Action area outside known range of this ESU.
Coho salmon (central California coast ESU) *Oncorhynchus kisutch*	Endangered	**Anadromous:** Spawns in coastal streams in fall and winter.	**None:** None recorded in San Francisco Estuary since early to mid-1980s (Leidy et al. 2005a).
		AMPHIBIANS	
California tiger salamander *Ambystoma californiense*	Threatened	Vernal pools, seasonal ponds, stock ponds, and associated grasslands.	**None:** No known occurrences in SFO vicinity. Ongoing maintenance and fill substrate precludes occurrence within airfield seasonal wetlands.
California red-legged frog *Rana aurora draytonii*	Threatened, Critical	Ponds, streams, drainages and associated uplands.	**None:** Known to occur on West-of-Bayshore property west of Highway

Table B: Federally Listed Species Potentially Occurring in the Vicinity of the San Francisco International Airport, San Mateo County, California

Species (Common and Scientific Name)	Status	Habitat	Potential for Occurrence within Action Area
	Habitat		101 but has never been observed nor is expected to occur east of Highway 101 due to significant physical barriers to dispersal and lack of suitable aquatic/upland habitat.
		REPTILES	
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	Endangered	Freshwater marshes, ponds, and slow-moving streams in San Mateo County and extreme northern Santa Cruz County; prefers dense cover and water depths of at least 1.0 ft (0.3 m).	**None:** Known to occur on West-of-Bayshore property west of Highway 101 but has never been observed nor is expected to occur east of Highway 101 due to significant physical barriers to dispersal and lack of suitable aquatic/upland habitat.
		BIRDS	
California clapper rail *Rallus longirostris obsoletus*	Endangered	Tidal salt marshes with sloughs and cordgrass (*Spartina* sp.).	**Known to Occur:** Four individuals heard calling in tidal marsh south of Runway 1R on October 12, 2010 (LSA observation). Field surveys conducted for the San Francisco Estuary Invasive Spartina Project detected individuals in tidal marsh south of Runway 1R in 2007, 2008, and 2009.
Western snowy plover *Charadrius alexandrinus nivosus*	Threatened	Sandy beaches, salt ponds, and salt pond levees. Needs sandy, gravelly, or friable soils for nesting.	**None:** Suitable habitat not present. No known nesting locations in project vicinity.
California least tern *Sterna antillarum browni*	Endangered	Sandy beaches, alkali flats, hard-pan surfaces (salt ponds).	**Very Low:** Migrating individuals may rarely forage over SF Bay waters adjacent to airfield, but regular airfield disturbance precludes nesting. No known nest colonies in project vicinity.
Marbled murrelet *Brachyramphus marmoratus*	Threatened, Critical Habitat	Old-growth coniferous forests near the coast. Requires trees with large branches or deformities that provide nest platforms.	**None:** Suitable habitat not present.
		MAMMALS	
Salt marsh harvest mouse *Reithrodontomys raviventris*	Endangered	Tidal salt marshes of SF Bay and its tributaries; requires tall, dense pickleweed (*Salicornia* sp.) for cover.	**None:** No known records in SFO vicinity. Tidal marsh southeast of airfield is marginal due to small size/linear configuration, lack of suitable high-tide refugia, proximity to disturbance and predators, and isolation from known populations to the south. Further information and analysis is presented in Section 4.1.6.

[1] National Marine Fisheries Service (NMFS) considers an ESU a "species" under the Endangered Species Act.

CDFG = California Department of Fish and Game
CNPS = California Native Plant Society
DPS = distinct population segment
ESU = Evolutionary Significant Unit.
ft = foot/feet
LSA = LSA Associates, Inc.
m = meter/meters
SF Bay = San Francisco Bay
SFO = San Francisco International Airport
URS = URS Corporation

Robust spineflower (*Chorizanthe robusta* var. *robusta*) and California seablite (*Suaeda californica*) are considered extirpated from the SF Bay area (CDFG 2005, 2010). The absence of chaparral, serpentine rock outcrops/soils, coastal sand dunes and scrub, and oak woodland precludes the occurrence of the following species: San Mateo thornmint (*Acanthomintha duttonii*), Presidio manzanita (*Arctostaphylos hookeri* ssp. *ravenii*), fountain thistle (*Cirsium fontinale* var. *fontinale*), San Mateo wooly sunflower (*Eriophyllum latilobum*), Marin dwarf flax (*Hesperolinon congestum*), beach layia (*Layia carnosa*), white-rayed pentachaeta (*Pentachaeta bellidiflora*), and Hickman's potentilla (*Potentilla hickmanii*). San Francisco lessingia (*Lessingia germanorum*) only occurs on old coastal sand deposits in the Presidio of San Francisco and on a single site in Daly City and thus is not expected to occur in the immediate vicinity of SFO. In summary, the site's highly developed setting and history of disturbance has resulted in the removal of native soils and plant communities in which these species occur.

Fifteen (15) additional animal species are not expected to occur on site, primarily due to an absence of suitable habitat. None of the four federally listed butterfly species occurring on the San Francisco Peninsula (San Bruno elfin, Bay checkerspot, Mission blue, and callippe silverspot) are expected to occur due to the lack of native coastal scrub and grassland habitats, and Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*) is extirpated south of the Golden Gate. Tidewater goby (*Eucyclogobius newberryi*) is considered to be extirpated from SF Bay (Moyle 2002). The SF Bay waters adjacent to SFO are outside the known range of delta smelt (*Hypomesus transpacificus*), which is limited to the Sacramento-San Joaquin Delta. Coho salmon (*Oncorhynchus kisutch*) (central California coast ESU) likely occurred within several San Francisco Estuary watersheds historically, but none have been recorded since the early to mid-1980s (Leidy et al. 2005a), indicating that this species has been extirpated from SF Bay. Steelhead belonging to the Central Valley ESU only occur in SF Bay as migrants from the ocean to the Sacramento and San Joaquin Rivers and their tributaries; the SF Bay waters surrounding SFO are outside the known range of this ESU. California tiger salamander (*Ambystoma californiense*) is considered absent due to the lack of suitable freshwater aquatic habitat and associated upland habitat.

Western snowy plover (*Charadrius alexandrinus nivosus*) is presumed absent due to the site's urban setting and consequent lack of undisturbed sandy beaches or bare levees. Small numbers of migrant or post-breeding California least terns (*Sterna antillarum browni*) may occasionally fly over or forage over the SF Bay waters adjacent to SFO. The primary nesting location of this species in SF Bay is in Alameda, and extended foraging in the project vicinity is highly unlikely. Marbled murrelets (*Brachyramphus marmoratus*) are not expected to occur in the project vicinity due to the absence of old-growth coniferous forest.

Both California red-legged frog (*Rana aurora draytonii*) and San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) are known to occur on SFO's West-of-Bayshore property west of Highway 101, but neither species has been observed east of the highway. Neither species is expected to disperse to the airfield due to significant physical barriers to dispersal including Highway 101, extensive drainage infrastructure, increased salinity, and absence of suitable upland/aquatic habitat on the airfield. This conclusion is consistent with the findings of the USFWS BO for SFO's Master Plan Project (USFWS 1996) and the long-standing USFWS position that neither species is present east of Highway 101 (i.e., on the airfield).

2.3 ESSENTIAL FISH HABITAT

As described above, all native SF Bay fish species are subject to the Magnuson-Stevens Act. Amendments to this Act in 1996 require all federal agencies to consult with NMFS regarding any action or proposed action that may adversely affect EFH for federally managed fish species. The Magnuson-Stevens Act defines EFH as "those areas and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." SF Bay waters surrounding SFO are considered EFH for fish species covered under the Pacific Groundfish FMP, Coastal Pelagic Species FMP, and Pacific Salmon FMP. As such, this BA will also address potential effects of the Proposed Action on EFH as a result of the proposed pile driving work associated with the modifications to the wooden trestles at the approach end of Runways 28L, 28R, and 19L that support the approach light systems.

3.0 ENVIRONMENTAL SETTING

3.1 VEGETATION AND COVER TYPES

3.1.1 Developed

Developed portions of the action area consist of the existing runways, taxiways, service/maintenance roads, buildings, and other structures/facilities associated with the SFO airfield. Vegetation associated with these areas is limited to sparse ornamental plantings of native and non-native trees or shrubs adjacent to some of the buildings.

3.1.2 Annual Grassland

Annual grassland is the dominant vegetation type in the infield areas between the airfield runways and taxiways. These areas are mowed regularly and occasionally sprayed with herbicides to control plant growth for safety reasons (ESA 1998, cited in URS 2001; required under 14 CFR part 139 – Wildlife Hazard Management). The density of vegetation cover in the infield areas is dependent on a variety of factors (e.g., elevation, soil compaction, and soil salinity) and ranges from mostly barren areas with no plant cover to sparsely vegetated areas with widely scattered plants to more densely vegetated areas nearing 100 percent cover. Vegetation cover in the infield areas also varies from areas dominated by mildly to moderately hydrophytic species (i.e., seasonal wetlands) to areas dominated by species commonly associated with uplands. Dominant species include ryegrass (Lolium sp.), cut-leaf plantain (*Plantago coronopus*), birds-foot trefoil (*Lotus corniculatus*), hare barley (*Hordeum murinum*), and pearly everlasting (*Anaphalis margaritacea*) (URS 2001).

3.1.3 Seasonal Wetlands and Freshwater/Brackish Marsh

Several seasonal wetlands with similar species composition to adjacent grasslands are also scattered throughout the infields and consist of topographic depressions that pond water during the rainy season. In addition to the species identified above, some depressions support brass buttons (*Cotula coronopifolia*), curly dock (*Rumex crispus*), and pickleweed.

A small amount of freshwater/brackish marsh vegetation occurs around the margins of two artificially constructed drainage features southeast of Runway 1R, the "South Oxidation Pond" and the "Bird Ball Ditch." The South Oxidation Pond is an earthen-bottomed sediment basin that was constructed in 1966 to collect surface runoff from the southern portion of the airport. The Bird Ball Ditch is a 40 ft (12 m) wide stormwater channel located north of the South Oxidation Pond that was also constructed to collect runoff from the southern portion of the airfield (see Figure 6). The channel is segmented into two ponds, one of which contains floating plastic bird balls used to discourage bird use in accordance with SFO's Wildlife Hazard Management Plan. The bird balls completely cover the surface of the downstream pond. A small band of alkali bulrush (*Scirpus robustus*) and cattails (*Typha latifolia*) is present around the margin of this feature and comprises the sole freshwater/brackish marsh vegetation in the action area. The bottom of the South Oxidation Pond

also supports hydrophytic species characteristic of seasonal wetlands, such as saltgrass (*Distichlis spicata*), prickle grass (*Crypsis vaginiflora*), velvet grass (*Holcus lanatus*), brass buttons, and curly dock. The slopes of both features are dominated by a dense growth of ruderal herbaceous species including wild radish (*Raphanus sativa*) and bristly ox-tongue (*Picris echioides*).

3.1.4 Tidal Marsh

Tidal marsh is a highly productive community consisting of salt-tolerant, hydrophytic plants that form moderate to dense cover. Plants are usually segregated by their elevation relative to the mean high and low tide elevations according to their tolerance of inundation and saline soils. This vegetation type is typically associated with and occurs adjacent to tidal mudflats that are devoid of vegetation (see below). Within the action area, tidal marsh is limited to a relatively narrow band (i.e., average width is approximately 50 to 100 ft [15 to 30 m]) southeast of Runway 1R. The VSR relocation work is limited to the upper edge of the tidal marsh (averaging approximately 10 ft [3 m] wide along the alignment) that borders the existing sheet pile wall and adjacent existing airfield roadway (see Figures 5 and 6).

The marsh is comprised of several elevational zones that vary in plant species composition due to differences in tidal inundation and subsequent variations in salinity. Lower marsh elevations adjacent to tidal mudflat and open water support dense stands of both native cordgrass (*Spartina foliosa)* and the non-native invasive smooth cordgrass (*Spartina alterniflora*). Cordgrass also grows along the margins of tidal channels that protrude into the middle and upper marsh elevations. Middle elevations are dominated by pickleweed, which intermixes with increasing amounts of alkali heath (*Frankenia salina*) and saltgrass as the marsh transitions into the adjacent upland zone. The adjacent upland zone is dominated by dense patches of non-native ruderal species, such as Italian thistle (*Carduus pycnocephalus*), iceplant (*Carpobrotus edulis*), bristly ox-tongue, and annual grasses.

3.1.5 Tidal Mudflats and Open Water

Tidal mudflats occur from below Mean Lower Low Water (MLLW) to Mean Tide Level (MTL) and support less than 10 percent of vascular vegetation (Goals Project 1999). Vegetation is typically dominated by various species of algae. The mudflats near SFO are comprised of silt, clay, and fine sand, and include organic debris and shell fragments. They also support a diverse community of benthic invertebrates such as clams, worms, mussels, and crabs, which are a valuable food source for many species of shorebirds (see below). This cover type is most prevalent in the Burlingame tidal flats southeast of the SFO airfield (i.e., Runway 1R-19L).

Open water refers to open SF Bay waters within the action area below MLLW. This would include shallow bay/channel (i.e., from MLLW to 18 ft [5 m] below MLLW) habitats as defined in Goals Project (1999). The sediments of shallow bays and channels are primarily composed of mud (Goals Project 1999). The trestle structures in the Bay that support the approach light systems are located at the approach ends of Runways 28L, 28R, and 19L in shallow water (see Figure 11).

4.0 STATUS OF THE SPECIES AND CRITICAL HABITAT IN THE ACTION AREA

4.1 FEDERALLY LISTED SPECIES AND CRITICAL HABITAT

4.1.1 Green Sturgeon – Southern Distinct Population Segment

The southern distinct population segment (DPS) of green sturgeon was federally listed as threatened on April 7, 2006 (71 FR 17757), which took effect on June 6, 2006. The southern DPS includes all populations originating from coastal watersheds south of the Eel River, with the only known spawning population in the Sacramento River. Critical habitat for the southern DPS of green sturgeon was designated by NMFS on October 9, 2009 (74 FR 52300) and took effect on November 9, 2009. This designation includes all waters of San Francisco Bay.

Green sturgeon spend the majority of their lives in nearshore oceanic waters, bays, and estuaries. Adults and juveniles are benthic feeders, with juveniles in the San Francisco Estuary known to feed on opossum shrimp (*Neomysis mercedis*) and amphipods (*Corophium* sp.) (Radtke 1966, cited in Moyle 2002). Spawning occurs in deep, fast water within the main stem of the Sacramento River and some of its larger tributaries (Moyle et al. 1992). Juveniles spend one to four years in fresh and estuarine waters before dispersing to saltwater (Beamesderfer and Webb 2002).

Potential for Occurrence. Green sturgeon is uncommon in the San Francisco Estuary, although records exist for Central and South San Francisco Bay (Leidy 2007). This species is only expected to occur in the Bay waters adjacent to SFO on an incidental basis. Stray individuals may occasionally venture near SFO from their primary migration route from the Golden Gate north to the Sacramento-San Joaquin Delta (an approximate distance of 25 miles), but such movements are expected to be rare and short-term in duration.

4.1.2 Chinook Salmon – Sacramento River Winter-Run Evolutionarily Significant Unit

The Sacramento River winter-run ESU of Chinook salmon was federally listed as endangered on January 4, 1994 (59 Federal Register [FR] 440); the endangered status was reaffirmed on June 28, 2005 (70 FR 37160). The ESU includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries, as well as two artificial propagation programs at the Livingston Stone National Fish Hatchery (NFH) and a captive broodstock program maintained at Livingston Stone NFH and the University of California's Bodega Marine Laboratory. Critical habitat for this ESU was designated on June 16, 1993, and includes: the Sacramento River from Keswick Dam, Shasta County, to Chipps Island at the westward margin of the Sacramento-San Joaquin Delta; all waters from Chipps Island westward to the Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge; and all waters of SF Bay (north of the San Francisco-Oakland Bay Bridge) from San Pablo Bay to the

Golden Gate Bridge (58 FR 33212). Therefore, the action addressed in this document is not located within any Chinook salmon critical habitat (i.e., hydrologic) units.

Adult winter-run Chinook salmon migrate up the Sacramento River to spawn from December through July, with peak migration occurring in March. Spawning occurs from late April through early August in clear, spring-fed rivers in the upper Sacramento basin below Shasta Dam, with peak spawning from May through June. Juveniles emerge from July through October and remain in their natal stream for 5 to 10 months before migrating downstream (Moyle 2002).

Potential for Occurrence. Fall-run Chinook salmon have been documented in some SF Bay watersheds (e.g., Guadalupe River, Walnut Creek), but whether fish from other runs, including winter-run, also enter such tributaries is not known (Leidy 2007). As such, this species is only expected to occur in the SF Bay waters adjacent to the project site on an incidental basis, if at all. Stray individuals may occasionally venture near SFO from their primary migration route from the Golden Gate north to the Sacramento-San Joaquin Delta (an approximate distance of 25 mi [40 km]), but such movements are expected to be rare and short term in duration.

4.1.3 Chinook Salmon – Central Valley Spring-Run ESU

The Central Valley spring-run ESU of Chinook salmon was federally listed as threatened on September 16, 1999 (64 FR 50393); the threatened status was reaffirmed on June 28, 2005 (70 FR 37160). The ESU includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries, including the Feather River, as well as the Feather River Hatchery spring-run Chinook program. Critical habitat for this ESU was designated on September 2, 2005, with an effective date of January 2, 2006. However, the action addressed in this BA is not located within any Chinook salmon critical habitat (i.e., hydrologic) units.

Immature spring-run Chinook salmon enter rivers from the ocean in spring and early summer, with the peak migratory period from May through June. Spawning occurs from late August through October in just a few streams in the Sacramento and Klamath drainages (Moyle 2002). Juveniles emerge from November through March, with some migrating downstream soon after emergence and others waiting until the following fall as yearlings.

Potential for Occurrence. Fall-run Chinook salmon have been documented in some SF Bay watersheds (e.g., Guadalupe River, Walnut Creek), but whether fish from other runs, including spring-run, also enter such tributaries is not known (Leidy 2007). As such, this species is only expected to occur in the SF Bay waters adjacent to the project site on an incidental basis, if at all. Stray individuals may occasionally venture near SFO from their primary migration route from the Golden Gate north to the Sacramento-San Joaquin Delta (an approximate distance of 25 mi [40 km]), but such movements are expected to be rare and short term in duration.

4.1.4 Steelhead – Central California Coast ESU

The central California coast ESU of steelhead was federally listed as threatened on August 18, 1997 (62 FR 43937); the threatened status was reaffirmed on January 5, 2006 (71 FR 834). This ESU includes all naturally spawned anadromous populations below impassable barriers in California streams from the Russian River to Aptos Creek, and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers. Critical habitat for this ESU was designated on September 2, 2005, with an effective date of January 2, 2006. This designation includes the SF Bay waters adjacent to SFO.

Steelhead within SF Bay may be classified as *ocean-maturing* or *winter* steelhead that typically begin their spawning migration during the fall and winter, and spawn within a few weeks to a few months from when they enter freshwater (McEwan and Jackson 1996, cited in Leidy 2007). Steelhead migrate upstream from the ocean after one to four growing seasons at sea (Burgner et al. 1992, cited in Leidy 2007). Upstream migrating steelhead may be observed within SF Bay and Suisun Marsh/Bay between August and March (Leidy 2007). Ocean-maturing steelhead typically spawn between December and April, with most spawning occurring between January through March (Moyle 2002). Steelhead may not die after spawning like Pacific salmon, and thus return to the ocean following spawning to spawn again the following year, and potentially a third or fourth time. Juvenile steelhead rear in freshwater for 1 to 4 years before migrating downstream.

Potential for Occurrence. Although no streams in the immediate site vicinity (e.g., Colma Creek, approximately 0.3 mi [0.5 km] north of SFO) are known to support anadromous steelhead, there are several known populations in streams further south (e.g., San Mateo Creek, San Francisquito Creek, Guadalupe River) (Leidy et al. 2005b). Small numbers of steelhead migrating to and from these streams may occasionally venture into the waters adjacent to SFO, although such occurrences would likely be incidental.

4.1.5 California Clapper Rail

The federally endangered California clapper rail is a year-round resident of tidal salt marshes of the San Francisco Estuary. It occurs primarily in emergent salt and brackish marshes with extensive stands of cordgrass and pickleweed, abundant dense vegetation at higher elevations for nesting and high-tide refugia, and a network of tidal channels that provide foraging habitat. Vegetation must be 19.7 in. (50.0 cm) high or greater near mean high water to allow for nest concealment and prevent tidal inundation (USFWS 2010b). Dense pickleweed or gumplant is usually selected as nesting substrate in the marshes around SF Bay (USFWS 2010b). Common food items include crabs, clams, worms, and insects. Cordgrass is an important habitat component for California clapper rails as it provides cover while foraging along tidal channels or marsh edges as well as nesting material (Albertson and Evens 2000). Physical attributes of a marsh that influence rail use and contribute to population sustainability include size of the marsh, location relative to other marshes, buffer areas between marsh and upland, marsh elevation, and hydrology (Albertson 1995). Predation is a major limiting factor for California clapper rails, with 12 native and 3 non-native species known to prey on clapper rails and their eggs (USFWS 2010c). The proliferation of non-native red foxes (*Vulpes vulpes*) in South Bay marshes since 1986 has had an especially deleterious effect on the regional clapper rail population. Norway rats (*Rattus norvegicus*), which thrive in artificial riprap shorelines,

are another major predator of clapper rail nests. Clapper rails residing in small, narrow strip marshes adjacent to riprap shorelines are especially vulnerable to Norway rat predation (USFWS 2010c).

Clapper rails vary in their sensitivity to human disturbance, both individually as well as between marshes. Clapper rails in some marshes (e.g., Palo Alto Baylands Nature Preserve) appear to be somewhat tolerant of nearby pedestrian traffic, while others appear to be quite sensitive to disturbance (USFWS 2008). For example, Albertson (1995) documented clapper rail territory abandonment in Laumeister Marsh in East Palo Alto shortly after a Pacific Gas and Electric Company (PG&E) repair crew began working on a nearby transmission tower. Clapper rail reactions to disturbance may vary by season, although both breeding and nonbreeding seasons are critical times for individual survival. Clapper rail mortality is greatest during the winter, primarily due to increased predation during extreme winter high tides (Albertson 1995). High-tide predation pressure is exacerbated in marshes adjacent to uplands frequented by humans and their pets since clapper rails hide within any available cover in transitional and high marsh habitats, and individuals flush when approached by people and/or pets, thus exposing them to predators (USFWS 2008). The presence of humans and their pets in or near the high marsh plain or uplands during marsh inundation may even prevent clapper rails from leaving the lower marsh plain to seek cover, which also leaves them vulnerable to predation (Evens and Page 1983, 1986; cited in USFWS 2008).

Potential for Occurrence. California clapper rails have recently been reported to occur in the tidal marsh along the southeastern edge of the airfield based on field surveys by the San Francisco Estuary Invasive Spartina Project (ISP). In 2006, breeding season surveys did not detect any clapper rails in the tidal marsh southeast of Runway 1R, but clapper rails were detected during breeding season surveys in 2007 (9–14 rails detected), 2008 (2–4 rails detected), and 2009 (2–4 rails detected) (Spautz 2007; McBroom 2008, 2009). LSA wildlife biologist Matt Ricketts also heard four clapper rails calling in the same marsh during an October 12, 2010, reconnaissance site visit, including two in a large stand of non-native cordgrass approximately 300 ft (91 m) southeast of the existing storm drain outfall pipes. The upper marsh provides marginal habitat quality for clapper rails due to its narrow, linear configuration and limited extent of dense vegetation for nesting and high-tide cover, but the presence of calling individuals during the breeding season (Spautz 2007; McBroom 2008, 2009) indicates that at least a few individuals may attempt to breed here. Extensive cordgrass cover, both native and non-native, in the middle and lower elevations of the marsh may be a key attractant for clapper rails in this marsh.

4.1.6 Salt Marsh Harvest Mouse

The federally endangered salt marsh harvest mouse is endemic to the tidal salt marshes and adjacent diked wetlands of the San Francisco Estuary. This species is dependent on a dense cover of native halophytes (salt-tolerant plants) and is typically associated with mid- to upper-marsh vegetation dominated by pickleweed and associated saline emergent vegetation (Shellhammer 1977). The most ideal habitat is deep (24–30 in. [60–76 cm] tall) and dense pickleweed, intermixed with fat hen and alkali heath (Shellhammer 1982), but salt marsh harvest mice have also been found in a number of "atypical situations" where pickleweed is sparse or lacking altogether (Botti 1986; LSA observation). However, even in these atypical situations, the presence of deep, persistent overhead cover appears to be necessary to support this species.

In addition, salt marsh harvest mice require nonsubmerged vegetation to escape high tides and flooding (Shellhammer et al. 1982). During high tides or periods of prolonged standing water, salt marsh harvest mice tend to concentrate in the upper portion of the high marsh zone (Fisler 1965) and adjacent uplands. They have also been found in the upper and transitional zones of tidal marshes that rarely flood, and will move into adjoining grasslands during the highest tides. Grasslands are also used as habitat when new grass growth affords suitable cover in spring and summer months (Fisler 1965; Shellhammer et al. 1982). Salt marsh harvest mice are seldom found in alkali bulrush (*Scirpus maritimus*), cordgrass, or pure stands of saltgrass (Shellhammer et al. 1982). "Strip" marshes with narrow middle and high marsh zones support few to no mice due to the more frequent and intense flooding associated with such marshes (USFWS 2010b). Most marshes of South SF Bay are strip-like marshes and, as such, support few mice (USFWS 2010b).

Potential for Occurrence. The closest known occurrence of salt marsh harvest mouse to SFO is a 1960 record in an unnamed marsh between O'Neill Slough and the Bayshore Freeway in Foster City, approximately 7.6 mi (12 km) southeast of SFO (CDFG 2010). Further south, salt marsh harvest mice are known to occur at Bair and Greco Islands in Redwood City, as well as in the marshes of Palo Alto and Alviso in Santa Clara County. With the exception of marsh fragments at the mouths of Mills Creek in Burlingame (0.9 mi [1.4 km] southeast of the project area) and Seal Point Slough in Foster City (5.3 mi [8.5 km] southeast of the action area), these occupied marshes are isolated from the action area by extensive areas of intervening development and rock riprap shoreline devoid of suitable habitat.

The tidal marsh along the southeastern edge of SFO is of marginal to poor habitat quality for salt marsh harvest mouse. The linear configuration of the marsh results in a relatively narrow band of pickleweed-dominated middle marsh that rarely exceeds 100 ft (30 m) in width. At high tides, the width of the middle marsh becomes even narrower, and at extreme high tides much of it becomes completely inundated. Dense vegetation in the upper marsh and adjacent uplands is limited, especially where it adjoins Bayfront Park where the marsh transitions directly into manicured turf grass and landscape plantings adjacent to the Bay Trail. Along the southeastern edge of the SFO airfield, vegetation consists of scattered ruderal forbs and iceplant along the base of a seawall; the width of this upland zone rarely exceeds 20 ft (6 m). Such conditions are unsuitable for the long-term persistence of salt marsh harvest mice due to continued exposure to predators during high tides. Predation pressure at Bayfront Park and the nearby SFO shoreline is known to be high due to the presence of typical urban predators (e.g., feral cats, raccoons, skunks, etc.) as well as avian predators such as great egret, snowy egret, and great blue heron. Olofson Environmental observed both terrestrial and avian predators in the marsh during California clapper rail surveys conducted in 2008 and 2009 (McBroom 2008, 2009).

The likelihood that the marsh along the southeastern edge of SFO supports a relict population of salt marsh harvest mice is extremely low. The Nichols and Wright (1971) diked historic bayland boundary map indicates that the area southeast of the SFO airfield historically consisted of open water habitat. As such, the existing tidal marsh southeast of the airfield is likely of recent origin (i.e., within last 30–50 years), forming due to the gradual deposition of sediment along the artificial fill of the airfield. Salt marsh harvest mice potentially occurring in the area prior to human settlement would not be present in such habitat. The Nichols and Wright (1971) map indicates that tidal marsh historically occurred immediately southeast of the airfield, including the area currently occupied by

Bayfront Park. Whether a portion of the existing marsh fringing Bayfront Park is a remnant of the original marsh is unknown, but the narrow width of the pickleweed zone, lack of tidal channels, and presence of rock riprap suggests otherwise.

The likelihood of salt marsh harvest mice colonizing the tidal marsh southeast of the SFO airfield from other marshes where they are known to occur is also highly unlikely. As described above, the closest known occurrence is a 1960 collection in Foster City over 7 mi (11 km) to the southeast. The marsh fragment in which mice were collected has since been isolated from the SF Bay shoreline by development, so the current status of salt marsh harvest mice in that location is itself unknown. Bair and Greco Islands are the only known extant populations of salt marsh harvest mice along the SF Bay shoreline in San Mateo County, and these marshes are located approximately 9 to 11 mi (14 to 17 km) southeast of SFO. As such, the dispersal of salt marsh harvest mice to SFO from locations further south is extremely unlikely due to the extensive development and riprap shoreline devoid of vegetation in the intervening distance.

In summary, salt marsh harvest mice are not expected to occur in the action area due to the marginal habitat quality of the existing tidal marsh (i.e., limited extent of pickleweed-dominated middle marsh and lack of dense cover in upper marsh and adjacent upland), isolation of the marsh from known populations farther south, abundance of terrestrial and avian predators, and the absence of adequate undisturbed/unmaintained uplands and upper marsh transition habitat adjacent to the tidal marsh that provides refugia during high-tide events.

4.2 ESSENTIAL FISH HABITAT

As mentioned above, the SF Bay waters adjacent to SFO are considered EFH for a variety of fish species covered under the Pacific Groundfish FMP, Coastal Pelagic Species FMP, and Pacific Salmon FMP, including the following species known to occur in SF Bay waters adjacent to SFO: northern anchovy, English sole, leopard shark, spiny dogfish, big skate, starry flounder, sand sole, curlfin sole, and Chinook salmon. Groundfish species occur in various marine habitat types from intertidal areas to the depths of the continental slope, on sand or mud bottoms, in rocky reef areas, or in the water column. Federally managed groundfish occurring in South SF Bay include over 90 species of rockfish, flatfish, roundfish, as well as sharks and skates. Pelagic species occur in the water column as opposed to living near the floor of the open ocean or estuaries. Representative species in South SF Bay include Pacific sardine, Northern anchovy, and market squid. Pelagic species can generally be found anywhere from the surface to 3,281 ft (1,000 m) deep. Anadromous salmonids, such as Chinook and coho salmon, are managed under the Pacific Salmon FMP. These species use freshwater streams and rivers for spawning. Young salmon then migrate to the ocean for feeding and growth, and return to their natal waters to spawn. Nearshore and inshore environments, such as those adjacent to SFO, are regions of physical and chemical variability due to the influx of freshwater from rivers and runoff from both urbanized and nonurbanized watershed lands (PFMC 2006).

5.0 EXISTING CONDITIONS AND CUMULATIVE EFFECTS

5.1 EXISTING CONDITIONS

The primary past and present human activities in the action area potentially affecting listed species are those related to the ongoing operations and maintenance at the airfield. Since SFO is a major international airport with continual airfield operations, infrastructure maintenance and improvement projects, ongoing aircraft activity, airfield support vehicle activity, and ambient noise levels are high. Terrestrial wildlife species using habitats on and adjacent to the airfield, including the tidal marsh southeast of Runway 1R, are exposed to near continuous noise and light disturbance associated with aircraft movements, landings and takeoffs, and have habituated to this baseline level. In addition, airfield maintenance activities, such as regular vehicle patrols, wildlife hazard management activities, repaving and light replacement, also contribute to ongoing disturbance levels. Automobiles and trucks traveling on the nearby Highway 101 and Millbrae Avenue overpass are another continual source of noise disturbance.

Specific airfield maintenance projects in the last 10 years include dike repairs near the approach ends of Runways 19L and 19R, and installation of a new seawall along the southeastern edge of Runway 1R. All of these actions had the potential to affect terrestrial species, but were unlikely to substantially affect marine species. In early 2000, SFO implemented an improvement project for the wooden trestles supporting the approach light systems off the ends of Runways 28L, 28R and 19L. Work associated with this project consisted of the replacement of portions of walkways, handrails, and other structural components of the wooden trestles, as well as replacing several existing pile wraps with new pile covers.

From 2006 to 2007, SFO implemented the North and West Fields Drainage Improvement Project, which involved the upgrade and expansion of an existing pump station at Seaplane Harbor in the northern portion of the action area. Seven new stormwater outfalls were constructed on the shoreline of SF Bay (into Seaplane Harbor) to improve drainage from the north and west field detention basin and to reduce flooding. Although the project had the potential to affect federally listed fish species and EFH, project-specific avoidance and minimization measures (e.g., silt curtains, pile-driving at low tide) were implemented, and formal consultation with USFWS and NMFS was not required.

The San Francisco Estuary ISP is a collaborative regional effort among local, State, and federal organizations to control the spread of non-native invasive cordgrass (*Spartina* sp.) species throughout tidal marshes of the San Francisco Estuary. The tidal marsh southeast of Runway 1R is one of the treatment sites for this project (ISP Site ID 19h). Breeding season surveys for California clapper rails from 2007–2009 at the marsh have documented a slight decrease in detections (i.e., 9–14 rails in 2007 vs. 2–4 rails in 2009), potentially due to a concurrent decrease in non-native Spartina cover due to ISP control efforts (McBroom 2009). Non-native cordgrass provides excellent cover for clapper rails, reducing their exposure to predators and tides. As such, changes in the population of non-native cordgrass may contribute to observed changes in clapper rail detections (McBroom 2009). Specific factors influencing population fluctuations in wildlife species are difficult to identify; however, recent

efforts to control non-native cordgrass adjacent to SFO may have affected the local clapper rail population by reducing the extent of available cover for nesting and high-tide refugia.

Another recent project partially located within the action area was the construction of Bayfront Park in Millbrae southeast of Runway 1R, which was completed in 2000. The park includes the northern terminus of the Bay Trail segment that begins at the mouth of Marina Lagoon near the San Mateo-Foster City border. California clapper rail is the primary federally listed species that may have been affected by this project. Park construction involved no in-water work, so effects to listed fish and EFH were likely nonexistent. Direct effects may have included loss of high-tide cover due to trail construction and associated landscaping, construction-related noise, and increased exposure to predators due to avoidance movements in response to construction. Likely indirect effects of this project included increased presence of humans and their pets on the Bay Trail and in the uplands adjacent to the tidal marsh, further exposing clapper rails to disturbance during high tides.

5.2 CUMULATIVE EFFECTS

Section 7 (FESA) regulations require the federal action agency to provide an analysis of cumulative effects when requesting initiation of formal consultation. Cumulative effects include the effects of future State, tribal, local, or private actions, not involving a federal action, that are reasonably certain to occur in or adjacent to the project site. Future federal actions that are unrelated to the Proposed Action are not considered in this analysis, because they require separate consultation pursuant to Section 7. Federal actions may include granting a permit for a project, authorizing funds for a project, or actually implementing a project.

For the purposes of this BA, cumulative effects are defined as environmental change that results from the incremental effects of several projects that may be individually minor, but which become significant when considered collectively. Future SFO projects that are reasonably certain to occur in or adjacent to the action area include the following: (1) SFO Replacement Airport Traffic Control Tower (ATCT) Project; and (2) Reclaimed Water System Project (see Figure 12). A brief description of these projects is provided below.

SFO Replacement ATCT Project. This project proposes to construct a replacement ATCT facility. A seismic evaluation of the structurally integrated ATCT facility and the Terminal 2 building in 2006 concluded extensive upgrades were required for the building and ATCT facilities to meet current seismic, building, and fire code standards and that damage from a major earthquake would render the ATCT (and SFO) inoperable. The Replacement ATCT is located in the paved airport operations area approximately 3,800 feet northwest of the tidal salt marsh habitat that would be disturbed by the relocation of the VSR. The Replacement ATCT is separated from the tidal salt habitat by Runway 1L/19R, Runway 1R/19L, and the VSR. While it appears unlikely that the Replacement ACTC would have any effect on federally listed species, the FAA must conduct a separate evaluation of the environmental effects of the Replacement ATCT, including an evaluation of the potential effects of that project on federally listed species. If the Replacement ATCT is found to have a potential to affect listed species, that project would require consultation between the FAA and the USFWS and/or NMFS under Section 7 of the FESA. The proposed ATCT Replacement Project is not associated with the proposed RSA Project that is the subject of this BA.

LSA

FIGURE 12

Reclaimed Water Project

- Treatment Facilities
- San Bruno Storage Line
- Irrigation Distribution Line
- MLTP to Lot C
- Lot C to T2

N

0 0.2 0.4
MILES

San Francisco International Airport
Runway Safety Area Project

Cumulative Impacts

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SFO Reclaimed Water System Project. This project proposes to treat the secondary effluent produced at SFO's wastewater treatment plant to meet the requirements of Title 22 water for reuse as nonpotable water throughout SFO. The project will involve installation of underground pipelines to distribute treated water, construction of tertiary and advanced treatment facilities, and installation of irrigation pipelines along the McDonnell Road corridor. This project is subject to separate and ongoing environmental review process.

Elements of these projects, which create noise, degrade water quality, or destroy habitat, could have effects on federally listed species in the region when considered collectively. For the purpose of this cumulative impacts evaluation, potentially deleterious elements of these projects could include the following potential effects: noise from building, construction, and demolition if it occurs adjacent to tidal marsh habitat, or degradation of water quality from construction, demolition, and/or other associated improvement projects, inadvertent invasive weed introductions and control efforts, anthropogenic fire ignitions, introduction of pets such as dogs and cats that could prey upon marsh dependent species, changes in local drainage/hydrology from irrigation runoff or new land use, and impacts from future airfield operations, infrastructure improvements and maintenance activities. These projects will, at a minimum, be subject to local environmental review and evaluation under CEQA. As such, the lead agency will be responsible for developing project-specific measures to avoid, minimize, and/or compensate for these effects where appropriate.

6.0 EFFECTS OF THE ACTION

6.1 ANADROMOUS FISH

If conducted during the migratory period (December 1 through June 14), pile installation activities related to modifications of the trestles in SF Bay that support the approach light systems at the ends of Runways 19L, 28L and 28R could directly affect green sturgeon, Chinook salmon, and/or steelhead that are present in the vicinity. Pile driving could affect migratory behavior or injure juvenile and larval steelhead if peak sound pressure levels exceed 190 decibels (dB).[1] Although there is little data on the sound pressure levels required to injure fish, short-term exposure to peak sound pressure levels above 190 dB are thought to cause physical injury to fish (Hastings 2002, cited in Hanson et al. 2003). However, 155 dB may be sufficient to temporarily stun small fish (J. Miner, pers. comm. 2002, cited in Hanson et al. 2003). Stunned fish, while not physically injured, are more susceptible to predation (Hanson et al. 2003).

The above effects are expected to be temporary in nature. The Proposed Action will implement avoidance and minimization measures that follow recommendations in the Corps' *Proposed Procedures for Permitting Projects that will Not Adversely Affect Selected Listed Species in California*, dated November 16, 2006 (2006 Corps NLAA[2] Programmatic; see Section 6.5 below), which was developed in consultation with USFWS and NMFS. Due to the limited and temporary effects of the Proposed Action on the waters of SF Bay, and the limited potential of listed fish species to be in the vicinity of the Proposed Action, this BA concludes that the Proposed Action *may affect, but is not likely to adversely affect*, green sturgeon, Chinook salmon, and/or steelhead. More specifically: 1) pile driving will be conducted outside the primary migratory period for these species; 2) work will be limited to low tides when the likelihood of fish being present near the work area is lowest; 3) silt curtains will be installed around the work area; and 4) a vibratory hammer will be used instead of an impact hammer for in-water work. Furthermore, given the relatively limited amount of work proposed on the trestle structures in the SF Bay that support the approach light systems and implementation of the measures described below, the Proposed Action *may affect, but is not likely to adversely affect (destroy or modify)* designated critical habitat for green sturgeon or steelhead.

6.2 CALIFORNIA CLAPPER RAIL

California clapper rails are known to occur in the tidal marsh along the southeastern edge of SFO and may attempt to breed there. Proposed project activities in or adjacent to the marsh consist of: (1) relocation of a 250 ft (76 m) long, 20 ft (6 m) wide VSR along the upper edge of the tidal marsh southeast of Runway 1R; and (2) removal and replacement of the five outfall pipes north of the Millbrae Highline Canal tide gate. Relocation of the VSR will result in the permanent loss of 0.04 ac (0.02 ha) of tidal marsh habitat for clapper rails. Although the area to be filled is considered relatively marginal clapper rail habitat due to adjacent disturbance, low vegetation density, and

1 All underwater sound levels referenced in this document are referenced to 1 micro-Pascal (1 μPa).

2 NLAA = not likely to adversely affect

limited middle and high marsh zones, the conversion of a small portion of the existing tidal marsh to a paved service road slightly reduces the extent of available foraging, roosting, and nesting habitat for the local clapper rail population. The VSR and outfall replacement work is not expected to result in the destruction or disturbance of active clapper rail nests since this work will occur outside the clapper rail breeding season.

In addition to the permanent impact of the VSR relocation and outfall replacement work on clapper rail habitat, the Proposed Action may have temporary construction-related impacts on clapper rails through increased levels of disturbance. Increased levels of disturbance to clapper rails may result from noise, light and/or vibrations from equipment and construction activities in the marsh (i.e., during VSR relocation and outfall replacement activities) and on the airfield. Operation of construction equipment in and adjacent to the marsh may result in displacement of clapper rails from protective cover and their territories. These disturbances may disrupt normal behavior patterns of breeding, foraging, sheltering, and dispersal, but such effects are expected to be short in duration and limited in frequency. Displaced clapper rails may have to compete for resources in occupied habitat and may be subject to increased predation, competition, mortality, and reduced reproductive success.

Implementation of the Proposed Action will result in approximately 10.0 ac (4 ha) of suitable clapper rail habitat southeast of Runway 1R being temporarily subject to increased noise, light, and other construction-related disturbance associated with project implementation. The 10.0 ac (4 ha) estimate consists of all tidal marsh habitat within 700 ft (213 m) of the airfield. However, given the ongoing noise levels and disturbance associated with airfield operations, nearby traffic on Millbrae Avenue and Highway 101, and use of the Bay Trail segment through Bayfront Park, it is expected that clapper rails occurring in the marsh are somewhat tolerant of moderate noise levels and disturbance. As such, implementation of the Proposed Action is not expected to appreciably contribute to the level of existing disturbance in the vicinity of the Proposed Action.

As the Proposed Action would permanently remove 0.04 ac (0.02 ha) of clapper rail salt marsh habitat in the vicinity of SFO, the Proposed Action *is likely to adversely affect* the California clapper rail. The measures to address the permanent and temporary impacts of the Proposed Action on California clapper rail are identified below in Section 6.5. Measures to avoid, minimize and compensate for these adverse effects to California clapper rail are incorporated into the project description and identified below in Section 6.5. With implementation of these measures, we conclude the Proposed Action would not jeopardize the continued existence or recovery of the species.

6.3 SALT MARSH HARVEST MOUSE

The Proposed Action is expected to have *no effect* on the salt marsh harvest mouse. The nearest known occurrence of this species is 7.6 mi (12 km) away. The salt marsh harvest mouse would not be expected to maintain a population in the vicinity of the project site because of the marginal habitat quality and limited extent of the existing tidal marsh adjacent to SFO, abundance of terrestrial and avian predators, limited suitable upland transition habitat/high-tide refugia adjacent to the marsh, and isolation of the marsh from known populations farther south (see Section 4.1.6 above).

6.4 ESSENTIAL FISH HABITAT

Pile driving associated with modifications to the trestles with approach light systems off the approach ends of Runways 28L, 28R and 19L may generate underwater sound pressure levels that could injure or kill fish. Pile driving activities associated with the modifications of the trestle structures in SF Bay may result in short-term increases in turbidity and release of contaminants. These temporary, construction-related effects to EFH will be avoided and/or minimized through the implementation of seasonal work windows and other avoidance and minimization measures as recommended in the 2006 Corps NLAA Programmatic (see Section 6.5 below). Consequently, the Proposed Action *may affect, but is not likely to adversely affect* EFH for the Pacific Groundfish FMP, Coastal Pelagic Species FMP, or Pacific Salmon FMP.

6.5 PROPOSED AVOIDANCE, MINIMIZATION, AND COMPENSATION MEASURES AS PART OF PROPOSED ACTION

6.5.1 Avoidance and Minimization Measures

The avoidance and minimization measures presented below have been incorporated into the Proposed Action and essentially serve as "built-in" mitigation measures to offset potential effects to listed species. Specifically, the proposed measures will address: (1) potential effects to federally-protected fish species due to pile driving activities associated with modifications to the wooden trestles in SF Bay that support the approach light systems; and (2) potential effects to California clapper rail as a result of the VSR relocation and outfall pipe replacement work.

Federally Listed Fish and Essential Fish Habitat. To avoid adverse effects on fish species protected under the FESA and EFH for federally managed fish species, the project will implement the avoidance and minimization measures presented below when installing new pilings in SF Bay associated with modifications to the trestles that support the approach light systems off the ends of Runways 28L, 28R, and 19L. These measures are based on the Corps' *Proposed Procedures for Permitting Projects that will Not Adversely Affect Selected Listed Species in California*, dated November 16, 2006.[1]

1. All pile installation activities associated with the modifications to the in-Bay trestle structures that support the approach light systems will occur between June 15 and November 30 to avoid time periods when federally-protected fish species have the greatest potential to occur in the vicinity of SFO.
2. All piles will consist of 20 in. (50 cm) diameter timber that is chemically-treated and wrapped with an impact-resistant, biologically inert material. All pilings will be driven with a vibratory hammer.
3. Prior to construction, silt curtains will be installed around the in-water work area to minimize potential sedimentation and turbidity resulting from pile driving. The silt curtains will extend from the water surface to the substrate.

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[1] Programmatic consultation completed with NMFS and USFWS on February 14, 2007.

4. All pile installation activities will be conducted during low tides (if feasible due to access considerations) when water levels are at their lowest to minimize potential noise-related effects to fish and other marine organisms and turbidity.
5. In areas of strong current, piles will be driven when such currents are reduced (i.e., centered around slack current) to minimize the number of fish exposed to adverse levels of underwater sound.

California Clapper Rail. To avoid adverse effects on California clapper rails, the project will implement the following avoidance and minimization measures:

1. Any project activities for the VSR relocation and outfall pipe replacement work within the tidal marsh along the southeastern edge of Runway 1R will be conducted outside the clapper rail breeding season (February 1–August 31, which follows recommendations in the 2006 Corps NLAA Programmatic). Construction in this area will be conducted from September 1 through January 31.
2. A qualified biological monitor will monitor all VSR relocation and outfall pipe replacement activities occurring in the tidal marsh. The biological monitor will have the authority to stop work if deemed necessary for any reason to protect California clapper rails.
3. Prior to the initiation of VSR relocation in the marsh, a qualified biologist familiar with clapper rail biology will meet with construction personnel to: (1) provide information on clapper rail identification, habitat, and behavior; (2) review project-specific measures implemented to minimize effects on clapper rails; and (3) summarize all required protection measures to be implemented and complied with to ensure that California clapper rails and their habitat are not impacted by construction activities.
4. To prevent equipment and personnel from entering the marsh and potentially disturbing foraging or roosting clapper rails, the perimeter of the VSR work area in the tidal marsh habitat will be staked and fenced with silt fencing. The fence will be installed under the guidance of a qualified biological monitor.
5. To minimize or avoid the loss of individual clapper rails, construction activities within or immediately adjacent to tidal marsh habitat for the VSR relocation and outfall pipe replacement work will not occur within 2 hours before or after extreme high tides (6.5 ft [1.9 m] or above, as measured at the Golden Gate Bridge) when the marsh plain is inundated because protective cover for clapper rails is limited and construction activities could prevent them from reaching available cover.

General Protection Measures. The following general protection measures will be implemented to minimize impacts on the tidal marsh and associated native plant and wildlife species:

1) Hazardous materials most likely to be used during VSR relocation and outfall pipe replacement include fuels, lubricants, and solvents. If any hazardous material is inadvertently discharged during construction, the discharge will be immediately controlled and cleaned up.

2) All vehicle and equipment staging and refueling areas will be located in uplands outside of the tidal marsh.
3) The VSR work area will be maintained in a clean condition. All trash (e.g., food scraps, cans, bottles, containers, wrappers, cigarette butts, and other discarded items) will be placed in closed containers and properly disposed of off site.
4) After construction is completed, all stakes, temporary fencing, flagging and other refuse generated by construction will be carefully and completely removed. No native vegetation (e.g., pickleweed) will be removed or disturbed during the final cleanup process.

6.5.2 Compensatory Mitigation

Table C: Proposed Compensatory Mitigation for Effects on Federally Listed Species

Federally Listed Species	Potential Effects	Proposed Mitigation
California Clapper Rail	A total of 0.04 ac (0.02 ha) of permanent impact to tidal salt marsh for relocation of Vehicle Service Road associated with Runway 1R shift	- 5:1 (created:filled) compensation ratio, consisting of 0.20 ac (0.08 ha) of tidal wetland mitigation habitat at Deepwater Slough Island Wetland Mitigation Project. - Various built-in construction mitigation measures
Anadromous Fish	Temporary impacts in SF Bay from pile installation activities (e.g., elevated underwater sound pressure levels, turbidity, etc.) associated with trestle modifications for approach light systems	- Various built-in construction mitigation measures.

Note: Additional compensatory mitigation (described below) is proposed for project impacts to 3.68 acres (1.49 ha) of jurisdictional wetlands and other waters of the United States that do not support federally listed species.

Federally Listed Species Impacts. To compensate for 0.04 ac (0.02 ha) of direct impacts to tidal marsh and associated California clapper rail habitat from the VSR relocation work, SFO will purchase (prior to construction) and apply 0.20 ac (0.08 ha) of agency-recognized constructed tidal wetland mitigation habitat from the Deepwater Slough Island Wetland Mitigation Project in Redwood City, California, as in-kind mitigation. This acreage represents a mitigation ratio of 5:1 (created tidal wetland acreage:impacted acreage).

Deepwater Slough Island contains 30 ac (12 ha) of high-quality tidal salt marsh habitat that was created in 2000 by removing dredged spoils that had been deposited on the island from the 1930s through the mid-1960s. The new tidal wetland habitat at Deepwater Slough Island was specifically designed to compensate for impacts to both California clapper rail and salt marsh harvest mouse as a result of construction of the Pacific Shores Center Project in Redwood City. As presented in the BO (dated October 9, 1998) for the Pacific Shores Center Project, "*Complete implementation of the plan*

to create 32 acres and enhance 104 acres of habitat for clapper rails and harvest mice on the Island, and other mitigation measures proposed by the applicant, will substantially compensate for project impacts" (BO; page 9). The BO further acknowledges that "*The Applicant will 'bank' the remaining ten acres of created tidal marsh, making them available to other project proponents requiring off-site compensatory mitigation*" (BO; page 4).

The majority of the marsh consists of a mid-elevation marsh plain dominated by pickleweed, with approximately 10,500 linear feet (3,200 linear meters) of created tidal channels. The restored marsh contains suitable habitat for the federally endangered salt marsh harvest mouse and California clapper rail, the latter of which has been heard calling on the periphery of Deepwater Slough Island (LSA observation). The marsh is also contiguous with the extensive marshes of the Bair and Greco Island complexes, which are known to support populations of both species.

Jurisdictional Waters Impacts. The Proposed Action will result in the fill of a total of 3.72 ac (1.51 ha) of jurisdictional wetlands and other waters of the United States, consisting of 0.37 ac (0.15 ha) of other waters (Bird Ball Ditch and Millbrae Highline Canal), 2.95 ac (1.19 ha) of seasonal wetlands (South Oxidation Pond and Seasonal Wetland A), and 0.04 ac (0.02 ha) of tidal marsh. A jurisdictional determination for the RSA project was submitted to the Corps on December 8, 2010. As of May 15, 2011, verification from the Corps has not been received. Other than the small amount of fill in tidal marsh which is addressed above under federally listed species impacts, the majority of project impacts (3.68 ac [1.49 ha]) will affect low-value, constructed, and maintained features that are part of the stormwater management system for the airfield and urban areas to the west. These features do not support any federally listed species nor do they provide habitat for listed species.

SFO plans to compensate for the remainder of jurisdictional impacts (3.68 ac [1.49 ha]) at a mitigation ratio of 2:1, which represents a target compensation acreage of 7.0 to 7.5 ac (2.8 to 3.0 ha). This mitigation is not intended to compensate for impacts to federally listed species. At this point in time, SFO is considering participation in the following wetland mitigation projects with the Presidio Trust to meet the target acreage: (1) Quartermaster Reach (approximately 5.0 ac [2.0 ha] of new habitat); (2) YMCA Reach (approximately 2 ac [0.8 ha] of new habitat); and (3) Mountain Lake (approximately 0.5 ac [0.2 ha] of new habitat). Other options include the purchase of credits from an agency-approved wetland mitigation bank (e.g., Area H in Redwood Shores; pending final agency approval). The overall mitigation program will be finalized by SFO and approved by the agencies prior to construction of the Proposed Action.

7.0 CONCLUSION

This BA forms the basis for the conclusions presented below regarding the effects of the Proposed Action on anadromous fish (green sturgeon, Chinook salmon, and steelhead), California clapper rail, and salt marsh harvest mouse. In addition, conclusions regarding effects on designated critical habitat for green sturgeon and steelhead, as well as effects on EFH, are based on the information contained herein.

The action area evaluated in this document contains suitable habitat for anadromous fish species (green sturgeon, Chinook salmon, and steelhead) and California clapper rail; these species are known to occur or have the potential to occur in the action area. After reviewing the current status of these species, the effects of the Proposed Action, and built-in measures proposed to avoid, minimize and compensate for effects to listed species, the FAA has determined that the Proposed Action: (1) *may affect, but is not likely to adversely affect* anadromous fish (green sturgeon, Chinook salmon, and/or steelhead); (2) *is likely to adversely affect* California clapper rail; and (3) would have *no effect* on salt marsh harvest mouse. Furthermore, the Proposed Action *may affect, but is not likely to adversely affect* designated critical habitat for green sturgeon and steelhead, and *may affect, but is not likely to adversely affect* EFH for federally managed fish species in SF Bay waters adjacent to SFO. Table C below summarizes the effects determination for the Proposed Action.

Table D: Effects Determination

Federally Listed Species	No Effect	May Affect, But Is Not Likely to Adversely Affect	Is Likely to Adversely Affect
Anadromous Fish		X	
California Clapper Rail			X
Salt Marsh Harvest Mouse	X		

With implementation of the avoidance, minimization and compensation measures identified in this BA, which are formally part of the project description, the Proposed Action is not expected to directly or indirectly reduce, in any appreciable manner, the likelihood of survival or recovery of California clapper rail by reducing their reproduction, numbers, or distribution. The measures proposed to offset anticipated effects provide reasonable protections to minimize adverse effects of the Proposed Action. The proposed avoidance and minimization measures will reduce losses of habitat for California clapper rail and the proposed compensation measure (i.e., Deepwater Slough constructed wetland acreage) would result in a net overall improvement in habitat conditions for clapper rail populations in the region.

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Appendix E2
Site Photographs


Photo Point #1. View of existing South Oxidation Pond facing east.


Photo Point #2. View of northern portion of Bird Ball Ditch. View facing southeast.

Source:
LSA, 2011

June 2011

SITE PHOTOGRAPHS

San Francisco International Airport
Runway Safety Area Program EA
San Francisco, California

APPENDIX E2

5/26/11 vsa/hk ...T:\SFO RSA\EA Jun11\AppxE2_Bio_sitephotos.ai

Appendix E3
NMFS EFH Concurrence Email

From:	Dave.Kessler@faa.gov
To:	Audrey Park
Cc:	Mia.Ratcliff@faa.gov; debbie.roth@faa.gov; Mark.McClardy@faa.gov
Subject:	Fw: NMFS EFH Consultation for SFO Airport Runway Safety Area
Date:	Friday, June 24, 2011 7:57:01 PM

Hi Audrey - for your Administrative File - here is the e-mail from NMFS on Essential Fish Habitat for the SFO Runway Safety Area Program.

Dave.

David B. Kessler, AICP
Project Manager, Southern Nevada Supplemental Airport &
Los Angeles International Airport
Environmental Impact Statements
Federal Aviation Administration
Western-Pacific Region
Telephone: 310/725-3615
FAX: 310/725-6848
----- Forwarded by Dave Kessler/AWP/FAA on 06/24/2011 07:56 PM -----

From: Maureen Goff <Maureen.Goff@noaa.gov>

To: Dave Kessler/AWP/FAA@FAA

Cc: "Korie.Schaeffer" <Korie.Schaeffer@noaa.gov>, 'Gary Stern' <Gary.Stern@noaa.gov>, 'Bryant Chesney' <Bryant.Chesney@noaa.gov>, Maureen.Goff@noaa.gov

Date: 06/16/2011 01:08 PM

Subject: NMFS EFH Consultation for SFO Airport Runway Safety Area

Dear Mr. Kessler,

Thank you for your letter of May 18, 2011, requesting consultation with NOAA's National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act. While your agency did not initiate for consultation on the Essential Fish Habitat (EFH) provisions of the Magnuson Stevens Fishery Conservation and Management Act (MSA), the proposed project will impact EFH. Therefore, this email serves as consultation under the authority of and in accordance with MSA. You will receive a separate letter for consultation under Section 7 of the Endangered Species Act.

NMFS has reviewed the proposed project as described in Department of Transportation, Federal Aviation Administration consultation initiation letter and Biological Assessment pertaining to the proposed Runway Safety Area (RSA) improvements for the San Francisco International Airport in San

Mateo County, California. The proposed project is anticipated to have the following impacts to EFH:

1). Noise from pile driving will be minimized by working at low tides when feasible and using a vibratory hammer. However, low frequency sound in the adjacent EFH waters may cause fish to leave the area temporarily.

2). Fill of 0.04 acre of tidal salt marsh and relocation and reconstruction of a seawall below high tide may adversely affect the function of EFH by simplifying shoreline habitat and modifying hydrology and nearshore sediment
transport. Replacement of tidal marsh habitat with artificial structures will result in a permanent reduction of local productivity and reduce the value of this area as foraging habitat for EFH species.

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for various federally managed fish species within Pacific Groundfish, Pacific Salmon, and Coastal Pelagic Fishery Management Plans. However, avoidance and minimization measures are in place to reduce temporary impacts to EFH associated with pile driving and
mitigation is proposed to compensate for permanent impacts to tidal and seasonal wetlands. Therefore, NMFS has no additional EFH Conservation Recommendations to provide.

This concludes EFH consultation for the proposed Runway Safety Area (RSA) improvements for the San Francisco International Airport in San Mateo County, California. Pursuant to 50 CFR 600.920(l), the U.S. Department of Transportation, Federal Aviation Administration must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' finding of negligible effects and no EFH Conservation Recommendations.

Thank you for consulting with NMFS.

Regards,
Maureen

Maureen Goff
Contractor with Ocean Associates, Inc.
Habitat Conservation Division
NOAA, National Marine Fisheries
777 Sonoma Ave, Room 325
Santa Rosa, CA 95404
ph: 707-575-6067
fax: 707-578-3435
maureen.goff@noaa.gov

Appendix E4
NMFS Section 7 Letter

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

November 3, 2011

In response, refer to:
2011/02063

RECEIVED

NOV - 7 2011

Federal Aviation Administration
Western-Pacific Region
Airports Division - AWP-600

David B. Kessler, AICP
Regional Environmental Protection Specialist
U.S. Department of Transportation
Federal Aviation Administration
P.O. Box 92007
Los Angeles, California 90009-2007

Dear Mr. Kessler:

Thank you for your letter of May 18, 2011, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. § 1531 *et seq.*), for proposed improvements to the Runway Safety Areas (RSA) at the San Francisco International Airport (SFO) owned and operated by the City and County of San Francisco, California. This response also serves as consultation under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act of 1934 (FWCA), as amended. The Federal Aviation Administration (FAA) proposes to conduct various improvements at four runways at SFO in order to enhance safety.

NMFS has reviewed the information provided with your May 18, 2011, letter, and supporting documents. Additional information regarding the project was provided to NMFS by David Kessler of the FAA via electronic mail between July 15, 2011, and October 24, 2011. The project has been proposed by FAA to comply with Public Law 109-115, which requires the completion of RSA improvements by airport sponsors that hold a certificate under Title 14, Code of Federal Regulations, Part 139, to meet FAA design standards by December 31, 2015. The project proposes to shift the location of four runways (10L-28R, 10R-28L, 1R-19L, and 1L-19R), construct new taxiways, and place specialized energy-absorbing light concrete beds (EMAS) at the ends of the runways. Additional project components include: (1) the realignment of a vehicle service road and an associated existing sheet pile seawall southeast of Runway 1R-19L; (2) demolition and relocation of an existing electrical substation building; (3) replacement of existing open surface water detention basins with an underground stormwater drainage system; and (4) relocation of runway lights, taxiway lights and signage. The majority of the above activities would occur in upland areas away from San Francisco Bay; similarly, the loss of 3.68 acres of seasonal wetlands as a result of the project will occur in areas inaccessible to listed

species and in which there is no designated critical habitat. Proposed activities associated with the shoreline and waters of San Francisco Bay include: (1) the realignment of a vehicle service road and an associated existing sheet pile seawall southeast of Runway 1R-19L; (2) relocation of runway lights, taxiway lights and signage; and (3) replacement of stormwater outfall pipes associated with the new underground drainage system (a subset of project component three, identified above).

FAA's proposed modifications to existing SFO navigational aids (*i.e.*, runway lights, taxiway lights and signage) will require the relocation and extension of three existing wooden trestles that support the lighting system at the approach ends of runways 1R-19L, 10R-28L, and 10L-28R. Relocation and extension of the trestles will include the installation of 30 new 20-inch diameter timber pilings in San Francisco Bay. It is anticipated that 3 to 5 piles will be installed per day by an impact hammer, and 30 work days will be required to complete trestle construction activities. The new underground stormwater system will include a concrete-lined underground detention basin and five new outfalls (two outfalls at 36 inches in diameter; two outfalls at 30 inches in diameter; one outfall at 18 inches in diameter) to replace existing outfall pipes. The five stormwater outfalls will be installed along the shoreline of San Francisco Bay on existing concrete pads. Existing wooden cradles upon which the outfall pipes rest at the shoreline would be raised by about 1.5 feet. Construction to replace the outfall pipes will be completed in approximately four weeks. The proposed relocation of a vehicle service road adjacent to Runway 1R- 19L will require realignment of an existing sheet pile seawall which supports the road on the bay side. Approximately 270 feet of the existing seawall will be removed with a vibratory hammer. The new seawall structure will consist of interlocking vinyl sheet piles and will be driven into the ground with a vibratory hammer to a depth of approximately 10 to 15 feet. The new seawall will link up to and match the height (of about four feet above ground) of the existing vinyl seawall. Approximately 0.04 acres of tidal marsh will be filled over a distance of 150 feet for realignment of the seawall and associated service road.

In an effort to minimize impacts due to the project's activities, the following measures have been proposed for in-water construction associated with the wooden trestles that support SFO navigational aids:

- All pile installation activities will occur between June 15 and November 30.
- All new pilings will be chemically-treated and wrapped with an impact-resistant, biologically inert material to prevent deterioration.
- All pile installation activities will be conducted during low tides, when water levels are at their lowest.
- In areas of strong current, piles will be driven when such currents are reduced (*i.e.*, during slack tide) to further minimize the number of fish exposed to increased underwater sound.
- Prior to construction, silt curtains extending from the water surface to the substrate will be installed around the in-water work area.
- To minimize the effects of erosion, sedimentation, and leakage of vehicle and equipment fluids during construction, a site specific Storm Water Pollution Prevention Plan (SWPPP) will be developed and implemented during all construction activities.

In an effort to minimize impacts due to the project's activities, the following measures have been proposed for shoreline construction associated with the seawall:

- All sheet pile driving activities will be accomplished from the existing vehicle service road and no construction equipment will enter the tidal marsh.
- A silt fence will be installed to minimize degradation of water quality, and prevent contaminants and debris from entering the water.
- All work in the tidal marsh will be conducted during low tides when the mudflat is exposed and the potential for sediment discharge is minimized.

In an effort to minimize impacts due to the project's activities, the following measures have been proposed for shoreline construction associated with the replacement of the stormwater drainage outfall pipes.

- Outfall pipe replacement work will not occur when the tidal marsh plain is inundated. This will require work to avoid periods within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge).
- The work area perimeter will be staked and fenced with silt fencing.
- All vehicle and equipment staging and refueling areas will be located in uplands outside of the tidal marsh.
- Disturbed areas will be hydroseeded or covered with mulch.
- No construction equipment will enter the tidal marsh area.

To compensate for the loss of 0.04 acres of tidal marsh, SFO will purchase and apply 0.20 acres of constructed tidal wetland mitigation habitat from the Deepwater Slough Island Wetland Mitigation Project in Redwood City, California as in-kind mitigation.

The FAA has concluded the proposed project is not likely to adversely affect ESA-listed salmonids, green sturgeon, or critical habitat, and requested NMFS' concurrence with this finding. Regarding Essential Fish Habitat (EFH) pursuant to the Magnuson Stevens Fishery Conservation and Management Act, FAA concluded the proposed project will not adversely affect EFH. NMFS evaluated the potential effects of this project on EFH and had no EFH conservation recommendations for this project. This determination regarding EFH was provided by email message from NMFS to Dave Kessler of the FAA on June 16, 2011.

Endangered Species Act

Available information indicates the following listed Distinct Population Segments (DPS) under the jurisdiction of NMFS may be affected by the proposed project:

Central California Coast steelhead (*Oncorhynchus mykiss*) **DPS**
threatened (71 FR 834, January 5, 2006)
critical habitat (70 FR 52488, September 2, 2005)
North American green sturgeon southern (*Acipenser medirostris*) **DPS**
threatened (71 FR 17757, April 7, 2006)
critical habitat (74 FR 52300, October 9, 2009)

The life history of steelhead is summarized in Busby *et al.* (1996). Central California Coast (CCC) steelhead use San Francisco Bay adjacent to the project area primarily as a migration corridor. This species passes through San Francisco Bay to rear as juveniles or to upstream areas to spawn as adults. Their migrations generally take place in the winter and spring months. With this project's in-water construction activities restricted to the period between June 15 and November 30, threatened CCC steelhead are unlikely to be present during construction.

The life history of threatened green sturgeon in California is summarized in Adams *et al.* (2002) and NMFS (2005). The southern DPS of North American green sturgeon include a single spawning population in the Sacramento River. They are anadromous, making migrations to the Sacramento River in the spring, with peaks in April-June (Moyle 1995). They hold in deep pools or holes in the mainstem Sacramento River to stage for spawning. Eggs are broadcast spawned over large cobble substrate, where they settle into the spaces between the cobbles. The juveniles spend one to four years in freshwater, before migrating to the ocean. As juvenile green sturgeon age, they migrate downstream and live in the lower delta and bays, spending from three to four years there before entering the ocean. Once in the ocean, green sturgeon range in coastal waters from Mexico to the Bering Sea. Green sturgeon have delayed sexual maturity, somewhere between 13-20 years and only spawn every two to five years. They have strong homing capabilities, which lead to high spawning site fidelity. Adult and juvenile green sturgeon may be present in San Francisco Bay and near the project site during construction.

NMFS has evaluated the proposed project for potential adverse effects to threatened CCC steelhead, threatened green sturgeon, and designated critical habitat. The shoreline of San Francisco Bay at SFO is highly developed and primarily consists of rock riprap. However, a small portion of the shoreline supports remnant tidal marsh vegetation. The proposed project may affect ESA-listed fish species during construction activities along the shoreline and at the wooden trestles.

Pile installation is required for construction of the seawall and wooden trestle structures. Pile driving by this project will likely degrade water quality in the project area. As piles are installed, soft sediments on the bay floor at the trestles will be disturbed and generate increased levels of turbidity in the adjacent water column. High levels of turbidity may affect fish by disrupting normal feeding behavior, reducing growth rates, increasing stress levels, and reducing respiratory functions (Benfield and Minello, 1996: Nightingale and Simenstad, 2001). For this project, FAA proposes to install silt curtains around each work site to limit the area affected by turbidity and suspended sediment. Work will also be limited to periods of low tide which will further reduce the distribution of fine sediments in the water column. Thus, elevated levels of turbidity during pile driving activities will be contained by the silt curtains and are not expected to extend into areas where listed steelhead or green sturgeon would be present. Pile driving for the realignment of the seawall will be limited to periods of low tide when the site is dewatered; thus, with regard to pile driving associated with the seawall, impacts to water quality are expected to be discountable or insignificant.

The installation of piles for wooden trestles and seawalls may create high underwater sound levels during pile driving. Available information indicates that fish may be injured or killed when exposed to very high levels of elevated underwater sound pressure waves generated from

driving steel piles with impact hammers. To assess the potential effects of pile driving, NMFS uses a dual metric criteria of 206 dB re one micropascal peak sound pressure level for any single strike and an accumulated Sound Exposure Level (SEL) of 187 dB re one micropascal squared-second to correlate physical injury to fish from underwater sound produced during the installation of piles with hammers (Caltrans 2009). As distance from the pile increases, sound attenuation reduces levels and the potential harmful effects to fish also decrease. For this project, FAA proposes to use an impact hammer to install the timber pilings. Hydroacoustic data collected from a similar project that utilized an impact hammer to drive timber piles within San Francisco Bay (Caltrans 2009) indicated that sound pressure levels created by this project should not present a risk of physical injury to threatened steelhead or green sturgeon. Disturbance and noise associated with construction at the pile driving sites may startle fish and result in dispersion from the action area. If listed fish react behaviorally to the sound produced by pile driving, adequate water depths and the open water area of San Francisco Bay adjacent to SFO will provide startled fish sufficient area to escape and elevated sound levels should not result in more than an insignificant effect on them.

Construction associated with replacement of the stormwater outfalls will occur on existing concrete pads at the shoreline of San Francisco Bay. Similar to the existing outfalls, the new outfalls will be supported by wooden cradles on the concrete pads. Work will occur during low tide and within an area confined by silt curtains. Working during low tide will minimize the amount of area inundated by tidal waters in the vicinity of the project and shallow water areas remaining in the vicinity during low tide do not provide conditions that are conducive for listed fish. Additionally, the silt curtains will exclude fish from access to the work site during construction. During the 4-week period of construction, listed fish will be prevented access to habitat within the silt curtain closure area, but adjacent areas within South San Francisco provide similar shoreline habitat and they will continue to have access to adjacent open water habitat. No heavy equipment will enter the tidal marsh area or waters of San Francisco Bay. For these reasons, construction of the stormwater outfalls is not expected to degrade water quality or disturb fish.

Upon completion, operation of the stormwater outfalls is not expected to degrade water quality in San Francisco Bay. Stormwater runoff will continue to be collected in the underground replacement basin and would continue to be discharged to Mel Leong Treatment Plant – Industrial Waste Process (MLTP-IWP) for first flush treatment. The quality of the water after treatment is not likely to adversely affect individual listed species because the water will undergo flocculation, dissolved air floatation, pH adjustment, aerobic biological treatment, and declorination. SFO operates under State of California Regional Water Quality Control Board Order No. R2-2007-0060 and NPDES Permit No. CA0028070, and all discharge points are sampled throughout the year. Increases in impervious surfaces could result in increased deposition of run-off. However, the increased volume of the runoff is not likely to affect individual listed species because first flush discharges will be treated as described above and the stormwater outfalls will be designed to reduce the potential for shoreline scour. The larger diameter of the outfall pipes will reduce water velocities and concrete splash pads located immediately below the outfalls will dissipate energy. Given facts discussed above, the impacts of construction are anticipated to be localized and insignificant or discountable. In addition, threatened CCC steelhead will not be present in San Francisco Bay during the proposed work

window for construction of the wooden trestles (June 15 to November 30); therefore, the likelihood that steelhead would be affected by this in-water work is discountable. Green sturgeon are present in San Francisco Bay year-round and could be in the vicinity of the project during construction, but this benthic species is well adapted to living in estuaries with fine sediment bottom and tolerant of turbidity greater than or equal to the levels expected to result from this project. For these reasons, the proposed construction activities at SFO by this project are not expected to impair or harm threatened CCC steelhead or green sturgeon. Upon completion of project construction, no further effects to listed species are anticipated.

Primary constituent elements (PCEs) of designated critical habitat for CCC steelhead in the action area include water quality and quantity, foraging habitat, natural cover including large substrate and aquatic vegetation, and migratory corridors free of obstructions. PCEs for designated green sturgeon critical habitat in estuarine areas include food resources, water flow, water quality, migratory corridor, water depth, and sediment quality. In this instance, the lateral extent of designated critical habitat for CCC steelhead is defined as the elevation of extreme high water. For green sturgeon, the lateral extent of designated critical habitat in bays and estuaries is defined as the elevation of mean higher high water. Aquatic habitat in the action area consists primarily of shallow water areas less than 20 feet in depth and the bay floor sediments are primarily silt and mud. As discussed above, both sound and turbidity effects during construction are expected to be insignificant. The new wooden piles for the trestles would be encased with an impact-resistant, biologically inert material. Therefore, the treated timber piles will not leach contaminants into the waters of San Francisco Bay. The relocation of the seawall may affect the shoreline by reducing the width of an existing tidal marsh area. The existing marsh adjacent to the seawall varies from 50 to 100 feet wide on the southeast side of Runway 1R-19L. The realignment of this wall will remove 0.04 acres of marsh along 150 linear feet of shoreline. This very small area of affected marsh is not anticipated to result in impacts to foraging, spawning, or migration of CCC steelhead or green sturgeon. The shoreline area adjacent to SFO does not provide spawning habitat and is not used as a migratory corridor for either listed species. Listed species are not able to forage in this location, as the proximity to the shoreline renders the site dry or very shallow even during periods of high tide. Considering the available area of tidal marsh and sub-tidal habitat areas in San Francisco Bay and the limited value of habitat along the shoreline of SFO, the loss of 0.04 acres of marsh vegetation by this project is not expected to degrade PCEs for CCC steelhead or green sturgeon. Overall, the potential effects of this project are considered insignificant or discountable and are not expected to result in either a net change to existing habitat values or result in adverse impacts to designated critical habitat.

Based on the best available scientific information, NMFS concurs with the FAA's determination that the proposed project at the San Francisco International Airport is not likely to adversely affect listed CCC steelhead, green sturgeon, or designated critical habitat. This concludes consultation in accordance with 50 C.F.R. § 402.13(a) for FAA's proposed RSA improvements at the SFO in San Mateo County, California. However, further consultation may be required if: (1) new information becomes available indicating that listed species or critical habitat may be affected by the project in a manner or to an extent not previously considered; (2) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not previously considered; or (3) a new species is listed or critical habitat is designated that may be affected by the action.

Fish and Wildlife Coordination Act

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration, and is coordinated with other aspects of water resources development (16 U.S.C. § 661). The FWCA establishes a consultation requirement for federal departments and agencies that undertake any action that proposes to modify any stream or other body of water for any purpose, including navigation and drainage (16 U.S.C. § 662(a)). Consistent with this consultation requirement, NMFS provides recommendations and comments to federal action agencies for the purpose of conserving fish and wildlife resources. The FWCA allows the opportunity to offer recommendations for the conservation of species and habitats beyond those currently managed under the ESA and MSA. NMFS has no FWCA recommendations to offer regarding this project because the project has proposed measures that adequately protect the marine environment.

If you have questions concerning these comments, please contact Lael A. Will at (707) 578-8554 or at Lael.Will@noaa.gov.

Sincerely,

for Rodney R. McInnis
Regional Administrator

cc: Jane Hicks, Corps of Engineers, Regulatory Branch, San Francisco, CA
Copy to File Administrative Record # 151422SWR2011SR00276

Literature Cited

Adams, P.B., C.B. Grimes, J.E. Hightower, S.T. Lindley, and M.L. Moser. 2002. Status Review for North American Green Sturgeon, Acipenser medirostris. National Marine Fisheries Service, Southwest Fisheries Science Center. 49 pages. [Document available at: http://www.nwr.noaa.gov/Other-Marine-Species/upload/grn-sturgeon-status.pdf]

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Appendix E5
Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

RECEIVED
NOV 28 2011
Federal Aviation Administration
Western-Pacific Region
Airports Division - AWP-600
NOV 28 2011

In Reply Refer To:
81420-2011-F-0595

Mr. David B. Kessler, AICP
Regional Environmental Protection Specialist
Federal Aviation Administration
Western-Pacific Region, Airports Division
P.O. Box 92007
Los Angeles, California 90009-2007

Subject: Formal Consultation for the Proposed Runway Safety Area Project, San Francisco International Airport, San Francisco, San Mateo County, California

Dear Mr. Kessler:

This letter is in response to your May 18, 2011, letter requesting formal consultation with the U.S. Fish and Wildlife Service (Service) for the proposed Runway Safety Area (RSA) Project at San Francisco International Airport (SFO), San Mateo County, California, which would be implemented by the City and County of San Francisco (CCSF) through the San Francisco Airport Commission. Your request for consultation was received by the Service on May 20, 2011. The Service concurs with the Federal Aviation Administration's (FAA) determination that the proposed action will not likely adversely affect the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*). Therefore, this document represents the Service's biological opinion on the effects of the proposed action on the endangered California clapper rail (*Rallus longirostris obsoletus*). No critical habitat has been proposed or designated for this species, therefore none will be affected.

This biological opinion is based on information provided in the following documents: (1) the FAA's consultation request letter, dated May 18, 2011, and associated information about the proposed action; (2) the *Biological Assessment for the San Francisco Airport Runway Safety Area Project* (Biological Assessment), dated May 17, 2011, prepared by LSA Associates, Inc. (LSA); and (3) miscellaneous correspondence and electronic mail concerning the proposed action between the Service, FAA, CCSF, and biological consultants for the project proponent. This opinion is also based on other relevant published and unpublished studies, communications on the distribution and abundance of the California clapper rail, and information available to the Service.

CONSULTATION HISTORY

January 20, 2011:	The FAA, CCSF, and LSA met with the Service to describe the proposed action and preliminary avoidance and minimization measures.
May 18, 2011:	The FAA requested formal consultation for the proposed action.
September 14, 2011:	The FAA requested a draft biological opinion from the Service for the section 7 consultation based on the Biological Assessment submitted to the Service on May 18, 2011.
June 2011-present:	Electronic mail messages and telephone conversations between the FAA and Service concerning the consultation for the proposed action.

BIOLOGICAL OPINION

Description of Proposed Action

The proposed action is located in an unincorporated part of San Mateo County, about 13 miles south of downtown San Francisco, east of Highway 101 near the cities of South San Francisco, San Bruno, and Millbrae. The majority of construction activities will occur at the four runways (or eight runway ends): Runways 1L-19R, 1R-19L, 10L-28R, and 10R-28L. All proposed action components are located on existing SFO property.

The CCSF, as owner and operator of SFO, proposes to implement the RSA Program, which involves improving the existing RSAs of all four runways at SFO to enhance safety. This effort is being undertaken by CCSF in response to the requirements of *The Transportation, Treasury, Housing and Urban Development, the Judiciary, the District of Columbia, and Independent Agencies Appropriations Act, 2006,* which requires completion of RSA improvements by airport sponsors that hold an airport operating certificate under Title 14 Code of Federal Regulations (CFR) Part 139, to meet FAA airport design standards by December 31, 2015 (Public Law [P.L.] 109-115, November 30, 2005 [119STAT. 2401]). The applicable airport design requirements are included in FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, and FAA Order 5200.8, *Runway Safety Area Program*. The proposed action is based on the preferred alternatives from the two RSA studies completed in August 2010.

The RSA Study Working Group determined that it is not practicable to create RSAs for Runways 1L-19R and 1R-19L that meet the applicable standards because of the position of the runways relative to the San Francisco Bay and Highway 101. An Engineered Materials Arresting System (EMAS) is proposed to be installed at these runway ends to enhance safety of the RSAs. An EMAS is a specialized system made of high-energy-absorbing materials that is installed in the RSA beyond the runway end. If an aircraft overshoots or undershoots the runway, these materials would be crushed by the landing gear, absorbing the forward momentum of the aircraft and decelerating and arresting the aircraft's movement. SFO is proposing to install a nonstandard

EMAS to enhance safety while minimizing potential environmental effects. The final dimensions of the EMAS beds to be installed will be determined by an engineering analysis during project design.

The proposed action also includes the use of "declared distances" for several of the runways. Declared distances are defined in Chapter 1 of FAA AC 150/5300-13, *Airport Design*. They involve the designation of specific lengths of runway pavement that are available for use by pilots in planning takeoffs or landings using that runway, considering the capabilities of their aircraft for safe operations, the Operations Specifications of the aircraft operator approved by the FAA under 14 CFR Part 119, or the operational standards of the aircraft operator. These designations allow remaining portions of the runway pavement to be designated as part of the RSA. Declared distances proposed as part of the proposed RSA Project include Takeoff Run Available, Takeoff Distance Available, Accelerate Stop Distance Available, and Landing Distance Available.

The proposed action also includes a number of related construction components, such as relocation/demolition of an existing electrical substation, new underground drainage installations and pump stations, relocation of runway/taxiway lights and signage, modifications to existing navigational aids, and installation of Runway Status Lights (RWSLs). Most of the construction work associated with the proposed action will occur on impervious/managed areas of the airfield.

SFO is required to meet FAA standards for RSAs under 14 CFR Part 139. P.L. 109-115 requires completion of RSA improvements by airport sponsors that hold an airport operating certificate under 14 CFR Part 139 to meet FAA airport design standards by December 31, 2015. A key requirement under these standards is that properly sized RSAs must be established around all runways. A RSA is a cleared and graded surface area around a runway needed for an aircraft to safely overshoot, undershoot or otherwise veer off a runway, and to provide greater accessibility for firefighting and rescue equipment during such incidents. RSAs should also include grading and/or storm water drainage to prevent significant water accumulation. The applicable requirements for RSAs are included in Table 3-3 of FAA AC 150/5300-13, *Airport Design*.

The proposed action will enhance the existing RSAs at the four runways (Runways 1L-19R, 1R-19L, 10L-28R and 10R-28L) at SFO to meet FAA airport design standards to the extent practicable under existing site constraints. Modifications for the project will entail minor relocations (shifting) of runway ends and realignments of taxiways, combined with the placement of EMAS beds at the ends of two runways (Runways 1L-19R and 1R-19L) where standard RSAs cannot reasonably be provided. The proposed action also includes a number of related components such as demolition and relocation of an existing electrical substation building, construction of new underground drainage installations and a pump station, relocation of runway and taxiway lights and signage, and modifications to existing navigational aids. While not part of the proposed action, installation of RWSL overlaps with the proposed construction schedule of the SFO RSA Program, and are therefore included with the proposed action. RWSLs are lights embedded in the runway and taxiway pavement that provide visual warnings to pilots when it is unsafe to cross runways and taxiways. The purpose of and design requirements for RWSLs are detailed in FAA AC 150/5340-30E, *Design and Installation Details for Airport Visual Aids*. For

example, the red takeoff hold lights are illuminated if the runway is unsafe for departures. There are three types of RWSLs that would be installed: runway-entrance hold lights, take-off hold lights, and runway intersection lights. These lights would be installed at all runway ends, associated taxiways, and intersection points.

The primary components of the RSA enhancements are described below by runway end:

Runway Shifts and Declared Distances:

- Shift Runway 1L-19R by about 450 feet to the south by extending the runway pavement at the south end and reducing the north end of the runway by a similar distance, thus providing 600 feet of RSA prior to the Runway 19R landing threshold while maintaining the existing runway length. The shift would allow RSA enhancements entirely on SFO property and without fill of San Francisco Bay.

- Shift Runway 1R-19L by about 200 feet to the south by extending the runway pavement at the south end of the runway by about 205 feet and reducing the north end of the runway by a similar distance, while maintaining the existing runway length. The shift would allow RSA enhancements entirely on SFO property and without fill of the San Francisco Bay.

- Implement declared distances on Runways 1L-19R, 1R-19L, 10L-28R, and 10R-28L.

South End – Runways 1L and 1R:

- Install a nonstandard EMAS bed (about 500 feet long and 220 feet wide) south of Runway 1L, with a 35-foot setback from the runway end.

- Install a nonstandard EMAS bed (about 380 feet long and 220 feet wide) south of Runway 1R, with a 35-foot setback from the runway end.

- Demolish portions of the existing Taxiway A and A1 pavement and construct a realigned Taxiway A extending between Taxiway B and Taxiway L around the south side of the new EMAS installations at the south end of the runways.

- Construct a new taxiway between Taxiway B, Runway 1L threshold, Runway 1R threshold, and Taxiway L, with a midfield connection to the relocated Taxiway A.

- Fill the South Detention Basin, located south of Runway 1L, for EMAS installation.

- Install new underground stormwater pipes aligned around the EMAS beds and Runways 1L and 1R. Stormwater would be directed to a new stormwater detention basin and pumped to the Mel Leong Treatment Plant for first flush treatment.

- Replace stormwater drainage outfall pipes with larger-diameter pipes in their existing location. Two of the new pipes will be 36 inches in diameter; the remaining four pipes will be replaced in-kind: two will be 30 inches in diameter, and one will be 18 inches in diameter. The existing timber trestle will be used to support the new outfall pipes. Up to 18 new timber blocks will be added to the trestle structure to facilitate outfall pipe installation. No additional pile driving, pile removal or fill will be conducted as part of the stormwater outfall pipe replacement activities.

- Realign the following features due to the EMAS installation to maintain the minimal safety distance outside of the taxiway object free area: (1) Vehicle Service Road (VSR); (2) aircraft blast fence; and (3) airport operations area security fence. The proposed VSR realignment will require the fill of 0.04 acre of tidal marsh to accommodate an approximately 250-foot segment of the new 30-foot-wide roadway and Aircraft Operation Area security fence south of Runway 1R.

- Relocate the electrical substation to maintain the minimal safety distance outside of the taxiway object free area.

East End – Runways 28L and 28R:

- Displace the landing thresholds for Runways 28L and 28R by 300 feet to the west to provide 600 feet of RSA prior to the landing thresholds.

- Relocate associated navigational aids, such as the glide slope antenna and the localizer antenna for Runways 28L and 28R, located on the airfield to accommodate the landing threshold displacement.

- Relocate portions of the approach light system for Runways 28L and 28R to accommodate the relocated landing threshold. Similar to Runway 19L, the approach light system for Runways 28L and 28R are also mounted on pile-supported wooden trestle structures in San Francisco Bay. Displacing the threshold by 300 feet would minimize the need to relocate the approach light system and structures that are spaced at intervals of 100 feet, consistent with FAA design criteria for Category II/III Instrument Landing Systems. As a result of the spacing, two approach light stations and associated wooden structures with side bars would be relocated by 300 feet for this runway. This work would involve the installation of a total of ten new 20-inch-diameter timber pilings in the San Francisco Bay. All new pilings will be chemically treated and wrapped with an impact-resistant, biologically inert material to prevent deterioration.

- The 500-foot-wide RSA at the approach end of Runway 28R includes a seasonal wetland/depressional ponding area that will be filled in accordance with FAA AC 150/5300-13, which requires that RSAs be level and free of obstructions, including areas that retain water. The seasonal wetland/ponding area is approximately 0.54 acre in size and is located approximately 50 feet from the edge of Runway 28R. Appropriate drainage

utilities would be constructed at the ponding area to meet and maintain FAA design standards for RSAs.

North End – Runways 19R and 19L:

- Install a nonstandard EMAS bed (about 550 feet long and 220 feet wide) north of the Runway 19R threshold, with a 50-foot setback from the runway end.

- Install a nonstandard EMAS bed (about 410 feet long and 220 feet wide) north of the Runway 19L threshold, with a 35-foot setback from the runway end.

- Decommission (remove taxiway lights and paint) and realign portions of existing Taxiways E and L, serving the north ends of the runways (Runways 19R and 19L) to the relocated runway threshold.

- Relocate portions of the approach light system for Runway 19L to accommodate the relocated landing threshold. The approach light system is mounted on timber pile-supported trestle structures in the San Francisco Bay and spaced at intervals of 100 feet, consistent with FAA design criteria for Category I approach light systems. Displacing the threshold by 200 feet on Runway 19L would minimize the need to relocate the entire approach light system and structures in the San Francisco Bay that are spaced at intervals of 100 feet. Modifying/extending the trestle structure for Runway 19L would involve the installation of a total of 20 new 20-inch-diameter timber pilings in the San Francisco Bay. All new pilings will be chemically-treated and wrapped with an impact-resistant, biologically inert material to prevent deterioration. The unused wooden trestles/pilings may be left in their current location to facilitate future modifications by the FAA to the existing approach light systems; all existing pilings are chemically-treated and wrapped.

West End – Runways 10R and 10L:

- Relocate the west end of the Runway 10R-28L pavement by 781 feet west to preserve the existing Runway 10R takeoff distance capability and existing runway end stagger, and relocate the existing localizer antenna for arrivals on Runway 28L.

- Construct a new taxiway connection between Taxiway S, the relocated threshold of Runway 10R, and Taxiway Z.

The proposed action has the potential to adversely affect California clapper rail, which is known to occur in the tidal marsh along the southeastern edge of SFO. Direct effects include the permanent loss of 0.04 acre of suitable California clapper rail habitat (tidal marsh) due to the proposed VSR relocation southeast of Runway 1R. Other potential effects include temporary construction-related disturbance from construction activities in and adjacent to the tidal marsh associated with the VSR relocation and outfall pipe replacement work.

Conservation Measures

The following conservation measures are proposed by SFO for implementation as part of the proposed action to minimize or eliminate potential adverse impacts to California clapper rail:

1. Any project activities for the VSR relocation and outfall pipe replacement work within the tidal marsh along the southeastern edge of Runway 1R will be conducted outside the California clapper rail breeding season (February 1–August 31). Construction in this area will be conducted from September 1 through January 31.

2. A Serviced-approved biologist will monitor all VSR relocation and outfall pipe replacement activities occurring in the tidal marsh. The Serviced-approved biologist will have the authority to stop work if deemed necessary for any reason to protect California clapper rails.

3. Prior to the initiation of VSR relocation and outfall pipe replacement work in the marsh, the Serviced-approved biologist, familiar with California clapper rail biology, will meet with construction personnel to: (1) provide information on California clapper rail identification, habitat, and behavior; (2) review project-specific measures implemented to minimize effects on California clapper rails; and (3) summarize all required protection measures to be implemented and complied with to ensure that California clapper rails and their habitat are not impacted by construction activities.

4. To prevent equipment and personnel from entering the marsh and potentially disturbing foraging or roosting California clapper rails, the perimeter of the VSR relocation and outfall pipe replacement work areas in the tidal marsh habitat will be staked and fenced with silt fencing. The fence will be installed under the guidance of the Serviced-approved biologist.

5. To minimize or avoid the loss of individual California clapper rails, construction activities within or immediately adjacent to tidal marsh habitat for the VSR relocation and outfall pipe replacement work will not occur within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge) when the marsh plain is inundated because protective cover for California clapper rails is limited and construction activities could prevent them from reaching available cover.

6. Hazardous materials most likely to be used during VSR relocation and outfall pipe replacement work include fuels, lubricants, and solvents. If any hazardous material is inadvertently discharged during construction, the discharge will be immediately controlled and cleaned up.

7. All vehicle and equipment staging and refueling areas will be located in uplands outside of the tidal marsh.

8. The VSR relocation and outfall pipe replacement work areas will be maintained in clean condition. All trash (e.g., food scraps, cans, bottles, containers, wrappers, cigarette butts, and other discarded items) will be placed in closed containers and properly disposed of off-site.

9. After construction is completed, all stakes, temporary fencing, flagging and other refuse generated by construction will be carefully and completely removed. No native vegetation (e.g., pickleweed) will be removed or disturbed during the final cleanup process.

10. To compensate for 0.04 acre of permanent impacts to tidal marsh and associated California clapper rail habitat from the VSR relocation, as well as temporary construction-related effects from the outfall pipe replacement work, SFO will purchase (prior to construction) and apply 0.20 acre of constructed tidal wetland mitigation habitat from the Deepwater Slough Island Wetland Mitigation Project in Redwood City, California, as in-kind mitigation. This acreage represents a mitigation ratio of 5:1 (created tidal wetland acreage:impacted acreage).

Action Area

The action area is defined in 50 CFR 5402.02, as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." For the proposed action, the action area encompasses a substantial portion of the airfield, including the four runway ends and associated taxiways (excluding the terminal and ramp areas), as well as: (1) all tidal marsh, mudflat, and open water habitat within 700 feet of the edge of the airfield southeast of Runway 1R (i.e., location of VSR relocation and outfall pipe replacement work); and (2) all San Francisco Bay waters within 3,281 feet of the pile driving work areas (i.e., locations where new pilings will be installed in the San Francisco Bay) at the approach end of Runways 28L, 28R, and 19L to facilitate modifications to the trestles that support the approach light systems.

The tidal marsh, mudflat, and open water habitat within 700 feet of the edge of the airfield were included in the action area. This 700 foot distance is based on a buffer distance considered adequate to protect breeding California clapper rails from construction-related effects. The 700 foot distance was therefore used for evaluating the potential construction-related effects of the airfield components of the RSA project on California clapper rails. The 700 feet is included in the larger action area for the proposed action. Other potential temporary effects, such as those from lighting and vibrations resulting from project construction activities extending beyond 700 feet from the action area, are expected to be nonexistent to negligible, especially given the high level of ongoing disturbance from aircraft movements and other operational activities on the airfield.

Analytical Framework for the Jeopardy Analysis

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on three components: (1) the *Status of the Species and Environmental Baseline,* which evaluates the range-wide conditions of the California clapper rail, the factors responsible for that condition, and the species' survival and recovery needs; (2) the *Effects of the Proposed Action,* which determines the direct and indirect effects of the proposed federal action and the effects of any interrelated or

interdependent activities on the species; and (3) *Cumulative Effects,* which evaluates the effects of future, non-federal activities in the action area on California clapper rail.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed federal action in the context of the current status of California clapper rail, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the California clapper rail and the role of the action area in the survival and recovery of the species as the context for evaluating the significance of the effects of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Status of the Species/Environmental Baseline

California Clapper Rail

Listing Status: The California clapper rail was listed as endangered on October 13, 1970 (35 **FR** 16047). Critical habitat has not been designated for this species. The California clapper rail is a Fully Protected Species under California law (See California Fish and Game Code Section 3511).

Description: This subspecies is one of three subspecies in California listed as endangered under the Act. The other subspecies include the light-footed clapper rail, which is found in tidal marshes in southern California and northwestern Baja California, and the Yuma clapper rail, which is restricted to the Colorado River basin. The California clapper rail is distinguishable from other clapper rails by its large body size of 13 to 19 inches from bill to tail, and weighs approximately 8.8 to 12.3 ounces. It has an orange bill, a rufous breast, black and white barred flanks, and white undertail coverts (Albertson and Evens 2000). Clapper rails are sexually dimorphic; the males are slightly larger than females (Garcia 1995). Juveniles have a pale bill and dark plumage. Clapper rails are capable of producing several vocalizations, most common of which are a series of keks or claps (Massey and Zembal 1987).

Natural History and Distribution: The California clapper rail is endemic to tidally influenced salt and brackish marshes of California. Historically, the California clapper rail occurred in tidal marshes along California's coast from Morro Bay, San Luis Obispo County, to Humboldt Bay, Humboldt County. Currently, California clapper rails are known to occur in tidal marshes in the San Francisco Bay Estuary (Estuary) (San Francisco, San Pablo, Grizzly, Suisun and Honker bays) (Olofson Environmental, Inc. 2011; CDFG 2011). California clapper rails are typically found in the intertidal zone and sloughs of salt and brackish marshes dominated by pickleweed, Pacific cordgrass, *Grindelia*, saltgrass, jaumea, and adjacent upland refugia. They may also

occupy habitats with other vegetative components, which include, but are not limited to, bulrush, cattails, and Baltic rush.

In northern San Francisco Bay, California clapper rails also occur in tidal brackish marshes that vary significantly in vegetation structure and composition, ranging from salt-brackish marsh to fresh-brackish marsh transitions (Service 2010). Use of brackish marshes by California clapper rails is largely restricted to major sloughs and rivers of San Pablo Bay and western Suisun Marsh, and along portions of Coyote Creek in the South Bay (Service 2010). California clapper rails were also found in nearly pure stands of alkali bulrush along Guadalupe Slough in 1990 and 1991 (H. T. Harvey & Associates 1990a, 1990b and 1991). On rare occasions, California clapper rails have been recorded even further upstream, in brackish/freshwater transition marshes, particularly during the non-breeding season. Although it has been suggested that habitat quality may be lower in brackish marshes than in salt marshes (Shuford 1993), further studies comparing reproductive success in different marsh types are necessary to determine the value of brackish marshes to California clapper rails.

The breeding period of the California clapper rail is prolonged. Pair bonding and nest building are generally initiated by mid-February. Nesting may begin as early as late February or early March (Evens and Page 1983), and extend through July in the South Bay, and into August in the North Bay (DeGroot 1927, Service unpubl. data). The end of the breeding season is typically defined as the end of August, which corresponds with the time when eggs laid during re-nesting attempts have hatched and young are mobile.

California clapper rails require an intricate network of sloughs that provide abundant invertebrate populations (Grinnell *et al.* 1918, DeGroot 1927, Harvey 1988, Collins *et al.* 1994) and escape routes from predators, particularly for vulnerable flightless young (Taylor 1894, Adams 1900, DeGroot 1927, Evens and Page 1983, Foerster *et al.* 1990, Evens and Collins 1992). In addition, the small natural berms along tidal channels with relatively tall vegetation, such as *Grindelia stricta*, provide elevated nesting substrate. Harvey (1988) and Foerster *et al.* (1990) reported mean clutch sizes of 7.27 and 7.47 eggs for California clapper rails, respectively. The California clapper rail builds a bowl shaped platform nest of marsh vegetation and detritus (DeGroot 1927; Harvey 1988; Foerster *et al.* 1990). The California clapper rail typically feeds on benthic invertebrates, but its diet is wide ranging, and includes seeds, and occasionally small mammals such as the salt marsh harvest mouse.

Dispersal or movements by clapper rails in California occurs between and outside of marshes (Orr 1939; Zembal *et al.* 1985; San Francisco Bay Bird Observatory 1986; Page and Evens 1987; Albertson 1995). Post-breeding dispersal has been documented during the fall and early winter (Lindsdale 1936, Orr 1939, Service unpubl. data, Albertson 1995). There is no clear evidence of migratory behavior in the California clapper rail. However, infrequent long distance dispersal does occur.

Threats: An estimated 40,191 acres of tidal marshes remained in 1988 of the 189,931 acres of tidal marsh that historically occurred in the Estuary; this represents a 79 percent reduction from

historical conditions (Goals Project 1999). The suitability of many remaining marshes for California clapper rails is limited, and in some cases precluded, by their small size, fragmentation, and lack of tidal channel systems and other micro-habitat features. These limitations render much of the remaining tidal marsh acreage unsuitable or of low value for the species. Habitat loss has dramatically slowed since the California clapper rail was listed in 1970, but ongoing disturbance and degradation precludes or reduces occupation of much of the remaining potential habitat by California clapper rails. Remaining habitat has been fragmented by levee systems that reduce and isolate patches of habitat, reduce/eliminate high marsh and refugial habitat, and make habitat accessible to predators and human disturbance. Habitat has been filled, subjected to many contaminants, converted to less suitable vegetation conditions by fresh wastewater discharges, and submerged by land subsidence caused by agricultural practices and groundwater overexploitation.

Loss of upper marsh vegetation has greatly reduced available habitat throughout the range of the California clapper rail. Most marshes in the South Bay are adjacent to steep earthen levees that have all but eliminated upper marsh vegetation and reduced available cover for California clapper rails during winter flood tides. In Suisun Marsh, high marsh vegetation has been eliminated by diking and livestock grazing. In addition to the problems associated with landscape alteration caused by development, California coastal wetlands are expected to be subject to the effects of global sea level rise and climate change due to global warming. The effects of past subsidence of marsh plain relative to mean tidal level, particularly in the South Bay (Atwater *et al.* 1979), are likely to be amplified by rising tidal levels.

Other than outright habitat loss due to marsh reclamation, significant historic degradation to California clapper rail habitat quality in remaining tidal marshes is caused by numerous human-caused physical and biological changes in the San Francisco Bay Estuary tidal marshes, including: construction and maintenance of dikes in tidal wetlands; replacement of tidal refugia along landward marsh edges with unbuffered urban edges; conversion of salt marsh to brackish-fresh marsh by urban fresh wastewater discharges; structural habitat change caused by non-native plant invasions (such as perennial pepperweed (*Lepidium latifolium*), ice plant, and mustard in high marsh); increased predation by attracted avian and mammalian predators due to availability of man-made structures (e.g., electrical towers, buildings, and boardwalks); increased disturbance from recreational access, including humans and dogs; reduced habitat quality and increased predation pressure from litter and debris; and contamination of marsh sediments, which may impact California clapper rails directly or indirectly (potential direct effects include toxicity to adults, chicks, or embryos, and potential indirect effects include reduced prey quality, quantity, and availability, and altered vegetation structure/composition for nesting and sheltering). Few of these causes of habitat degradation are independent of one another; they interact and mutually amplify (Service 2010).

Wastewater discharges that alter natural salinity levels in tidal waters can adversely affect California clapper rail populations and other species. Since about 1970, freshwater discharges on the order of 120 million gallons/day from the San Jose Water Pollution Treatment Plant, have led to the conversion of approximately 300 acres of former salt marsh to fresh and brackish marsh at the southern end of San Francisco Bay along Coyote Creek and adjoining sloughs of the Santa

Clara Valley (H.T. Harvey and Associates 1997). Marsh conversion may lower the habitat quality and carrying capacity of tidal marshes to support California clapper rails, as evidenced by lower population and nesting densities recorded in brackish marshes than salt marshes (H.T. Harvey and Associates 1989).

California clapper rails vary in their sensitivity to human disturbance, both individually and between marshes. California clapper rails have been documented nesting in areas with high levels of disturbance, including areas adjacent to trails, dikes, and roads heavily used by pedestrian and vehicular traffic (J. Didonato pers. comm., Baye *in litt.* 2008). In contrast, Albertson (1995) documented a California clapper rail abandoning its territory in the Laumeister Tract, shortly after a repair crew worked on a nearby transmission tower.

California clapper rail reactions to disturbance may vary with season; however, both breeding and non-breeding seasons are critical times. California clapper rail mortality is greatest during the winter, primarily due to predation during extreme winter high tides (Eddleman 1989; Albertson 1995). Human-related disturbance may increase the California clapper rail's vulnerability to predators. During high tides, California clapper rails and other wildlife hide within any available cover in the transition zone and high marsh. As people approach, the birds may flush and attract predators. The presence of people and their pets in or near the high marsh plain or upland areas during marsh inundation may even prevent California clapper rails from leaving the lower marsh plain to seek cover, which also leaves them vulnerable to predation (Evens and Page 1983; Evens and Page 1986). Public trails that run along a narrow marsh transition zone may be particularly hazardous to California clapper rails that depend on this habitat for refuge during high tides.

Throughout the Estuary, the remaining California clapper rail population is affected by a suite of mammalian and avian predators. At least 12 native and three non-native predator species are known to prey on various life stages of the California clapper rail (Albertson 1995). Artificially high local populations of native predators, especially raccoons, skunks, and common ravens occur due to the presence of landfills and other sources of human food waste adjacent to marshes. Feral cats also represent another predation threat on adult and young California clapper rails near residential areas and landfills (Albertson 1995). Non-native Norway rats have long been known to be effective predators of California clapper rail nests (DeGroot 1927; Harvey 1988; Foerster *et al.* 1990). According to Harvey (1988) and Foerster *et al.* (1990), predators, especially rats, accounted for California clapper rail nest losses of 24 to 29 percent in certain South Bay marshes. Placement of shoreline riprap, levees, buildings, and landfills favor rat populations, which results in greater predation pressure on California clapper rails in certain marshes. Encroaching development displaces lower order predators from their natural habitat and adversely affects higher order predators, such as coyotes, which will normally limit population levels of lower order native and non-native predators, especially red foxes (Albertson 1995).

These predation impacts are exacerbated by a lack of high marsh and natural high tide cover in most remaining marshes. DeGroot (1927) noted that clapper rails were extremely vulnerable to predation by raptors during high tide events when they were forced to seek refuge in exposed locations. Similarly, Johnston (1956 and 1957) and Fisler (1965) observed heightened predator

activity in marshes coinciding with extreme high tides. Evens and Page (1986) also documented the susceptibility of California black rails to predation during extreme high tides. More recently, California clapper rail predation was noted in west Marin during extreme high tides in 2005 (G. Block, pers. comm.). There is an abundance of falcons, raptors, egrets, and herons during high tides that opportunistically take advantage of prey during this vulnerable period.

The proliferation of non-native red foxes into tidal marshes of the South Bay since 1986 has had a profound effect on California clapper rail populations. As a result of the rapid decline and almost complete elimination of California clapper rail populations in certain marshes, the Don Edwards San Francisco Bay National Wildlife Refuge implemented a predator management plan in 1991 (Foerster and Takekawa 1991) with an ultimate goal of increasing California clapper rail population levels and nesting success through management of red fox predation. This program was successful in increasing the South Bay California clapper rail populations from an all-time low.

Mercury accumulation in eggs is perhaps the most significant contaminant problem affecting California clapper rails in the Estuary, with the South Bay containing the highest mercury levels. Mercury is extremely toxic to embryos and has a long biological half-life. Schwarzbach *et al.* (2006) found high mercury levels and low hatching success (due both to predation and, presumably, mercury) in California clapper rail eggs throughout the Estuary. California clapper rail habitat is also at risk of contamination due to oil spills (Baker *et al.* 2009).

The population viability analysis for California clapper rails identified changes in adult survivorship as the factor with the largest influence on population growth rates (M. Johnson, pers. comm.). Another model also indicates that adult survivorship of California clapper rails is the primary demographic variable for maintaining a stable population or causing the population to either increase or decline (Foin *et al.* 1997). These models indicate that survival of adult birds has the strongest effect on the perpetuation or extinction of the overall population.

Population Status and Trends: The California clapper rail population was first estimated at 4,200 to 6,000 birds between 1971-1975, of which 55 percent occurred in the South Bay and 38 percent in the Napa Marshes (Gill 1979). Although the population was estimated at only 1,500 between 1981-1987 (Harvey 1988), the difference between these two estimates is believed to be partially due to survey intensity. Breeding season density data indicate that populations remained stable during the 1970s (Gill 1979, Harvey 1980), but reached an estimated all-time historical low of about 500 birds in 1991, with about 300 California clapper rails in the South Bay (Harding *et al.* 1998). California clapper rail numbers have rebounded between 1990s and 2007. However, substantial increases in population may be difficult to achieve due to the current disjunct distribution of their habitat (Albertson and Evens 2000).

Bay-wide California clapper rail numbers have been declining overall since 2007, and the decline is highly correlated with efforts to eradicate invasive *Spartina* in the San Francisco Estuary. U.S. Geological Survey (USGS) data suggest that Bay-wide California clapper rail call count numbers declined by as much as 50 percent between 2007 and 2011. Point Reyes Bird Observatory

Conservation Science (PRBO) conducted Estuary-wide surveys of the San Francisco Bay for California clapper rail between 2005 and 2010. Results of the 2008 survey indicated only 543 rails, compared to 938 rails detected in 2007 (PRBO 2009b). In both years, the South Bay accounted for the majority of California clapper rails. Between 2005 and 2008, the estimated Estuary-wide total population of California clapper rails decreased by about 21 percent (Liu *et al.* 2009). The South Bay population of California clapper rails decreased by 54 percent between 2007 and 2008 (Liu *et al.* 2009). The Invasive Spartina Project (ISP) California clapper rail survey data collected at 30 sites from 2004-2010 also shows an overall decline in California clapper rails. The population increased by 25 percent between 2005 and 2006 and by 25 percent again between 2006 and 2007. Then count numbers decreased by 35 percent between 2007 and 2008, by 32 percent from 2008 to 2009 and by 13 percent from 2009 to 2010.

Data collected by ISP from 2004 to 2010 at 30 sites within the San Leandro Bay, the Hayward region, the San Francisco Peninsula, and the Newark region, showed a decline in California clapper rail numbers from 519 in 2007 to 202 in 2010. USGS data suggests that, Bay-wide California clapper rail call count numbers declined by approximately 50 percent between 2007 and 2011. According to the *California Clapper Rail Population Monitoring Report: 2005-2008*, the Estuary-wide California clapper rail population showed an overall negative trend (-20.6 percent, P <0.0001) from 2005 to 2008, which can be mostly attributed to the 57 percent decline seen in the South Bay from 2007 to 2008 (PRBO 2009a). This decrease in the population of California clapper rails in 2008 is highly correlated with large scale *Spartina* eradication during this period which resulted in the loss of cover. In 2010, PRBO detected an increase of California clapper rails in San Pablo Bay and South San Francisco Bay, while ISP detected a decline at other locations. This difference suggests that mature marshes (surveyed by PRBO) which received a high degree of hybrid *Spartina* control still provided enough native habitat to support stable California clapper rail population, while young marshes (surveyed by ISP), where hybrid *Spartina* was a more significant component of marsh vegetation cover, no longer provided habitat for California clapper rails because California clapper rails in these marshes were dependent on the hybrid *Spartina* for cover. It is unknown if the increased number of California clapper rails detected at some locations is due to high breeding success or is a result of immigration from marshes where *Spartina* treatment resulted in a loss of high tide refugia habitat. In addition, high tide surveys conducted by East Bay Regional Parks District (EBRPD) showed decreases in California clapper rail numbers in San Leandro Bay since 2007. An extreme decline on EBRPD land occurred at Arrowhead Marsh which went from 112 California clapper rails in 2007 to 35 in 2010.

Recovery Actions: The *Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (Draft Recovery Plan; Service 2010) is an expansion and revision of *The California Clapper Rail and Salt Marsh Harvest Mouse Recovery Plan* (Service 1984). The Draft Recovery Plan is scheduled to be finalized in 2012. The Draft Recovery Plan features the California clapper rail along with four other endangered species. The Draft Recovery Plan identifies high priority areas for tidal marsh and ecotone restoration including restoring many of the salt ponds and other diked baylands along San Francisco Bay to tidal action. Thousands of acres of former salt ponds and other diked baylands along San Francisco Bay have been restored

or are proposed to be restored to tidal action (Service file number 81420-2008-F-0621; Service 2008); however, it may take decades before many of the heavily subsided areas within the former salt ponds accumulate enough sediment to become suitable tidal marsh habitat for California clapper rails. The Don Edwards San Francisco Bay National Wildlife Refuge with assistance from the U.S. Department of Agriculture Wildlife Service currently manages mammalian and avian predators within California clapper rail habitat on its refuge lands in the South Bay; however, the Predator Management Program is underfunded.

Within the action area, California clapper rails have recently been reported to occur in the tidal marsh along the southeastern edge of the SFO airfield based on field surveys by the San Francisco Estuary Invasive Spartina Project (ISP). In 2006, breeding season surveys did not detect any California clapper rails in the tidal marsh southeast of Runway 1R, but California clapper rails were detected during breeding season surveys in 2007 (9-14 rails detected), 2008 (2-4 rails detected), and 2009 (2-4 rails detected) (Spautz 2007; McBroom 2008, 2009). LSA wildlife biologist Matt Ricketts also heard four California clapper rails calling in the same marsh during an October 12, 2010, reconnaissance site visit, including two in a large stand of non-native cordgrass approximately 300 feet southeast of the existing storm drain outfall pipes. The upper marsh provides marginal habitat quality for California clapper rails due to its narrow, linear configuration and limited extent of dense vegetation for nesting and high-tide cover, but the presence of calling individuals during the breeding season (Spautz 2007; McBroom 2008, 2009) indicates that at least a few individuals may attempt to breed here. Extensive cordgrass cover, both native and non-native, in the middle and lower elevations of the marsh may be a key attractant for California clapper rails in this marsh.

Environmental Baseline

Regulations implementing the Act (50 CFR 5402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated effects of all proposed federal projects in the action area that have undergone section 7 consultation and the effects of state and private actions that are contemporaneous with the consultation in progress.
The primary past and present human activities in the action area potentially affecting California clapper rails are those related to the ongoing operations and maintenance at the airfield. Since SFO is a major international airport with continual airfield operations, infrastructure maintenance and improvement projects, ongoing aircraft activity, and airfield support vehicle activity, ambient noise levels are high. Terrestrial wildlife species using habitats on and adjacent to the airfield, including the tidal marsh southeast of Runway 1R, are exposed to near continuous noise and light disturbance associated with aircraft movements, landings and takeoffs, and have habituated to this baseline level. In addition, airfield maintenance activities, such as regular vehicle patrols, wildlife hazard management activities, repaving and light replacement, also contribute to ongoing disturbance levels. Automobiles and trucks traveling on the nearby Highway 101 and Millbrae Avenue overpass are another continual source of noise disturbance.

Specific airfield maintenance projects in the last 10 years include dike repairs near the approach ends of Runways 19L and 19R, and installation of a new seawall along the southeastern edge of Runway 1R. In early 2000, SFO implemented an improvement project for the wooden trestles supporting the approach light systems off the ends of Runways 28L, 28R and 19L. Work associated with this project consisted of the replacement of portions of walkways, handrails, and other structural components of the wooden trestles, as well as replacing several existing pile wraps with new pile covers.

The San Francisco Estuary ISP is a collaborative regional effort among local, State, and federal organizations to control the spread of non-native invasive cordgrass (*Spartina* sp.) species throughout tidal marshes of the San Francisco Estuary. The tidal marsh southeast of Runway 1R is one of the treatment sites for this project (ISP Site ID 19h). Breeding season surveys for California clapper rails from 2007 to 2009 at the marsh have documented a slight decrease in detections (i.e., 9-14 rails in 2007 vs. 2-4 rails in 2009), potentially due to a concurrent decrease in non-native Spartina cover due to ISP control efforts (McBroom 2009). Non-native cordgrass provides excellent cover for California clapper rails, reducing their exposure to predators and tides. As such, changes in the population of non-native cordgrass may contribute to observed changes in California clapper rail detections (McBroom 2009). Specific factors influencing population fluctuations in wildlife species are difficult to identify; however, recent efforts to control non-native cordgrass adjacent to SFO may have affected the local California clapper rail population by reducing the extent of available cover for nesting and high-tide refugia.

Another recent project partially located within the action area was the construction of Bayfront Park in Millbrae southeast of Runway 1R, which was completed in 2000. The park includes the northern terminus of the Bay Trail segment that begins at the mouth of Marina Lagoon near the San Mateo-Foster City border. California clapper rail is the primary federally listed species that may have been affected by this project. Park construction involved no in-water work, so effects to listed fish and Essential Fish Habitat (EFH) were likely nonexistent. Direct effects may have included loss of high-tide cover due to trail construction and associated landscaping, construction-related noise, and increased exposure to predators due to avoidance movements in response to construction. Likely indirect effects of this project included increased presence of humans and their pets on the Bay Trail and in the uplands adjacent to the tidal marsh, further exposing California clapper rails to disturbance during high tides.

Effects of the Proposed Action

California clapper rails are known to occur in the tidal marsh along the southeastern edge of SFO and may attempt to breed there. Proposed action activities in or adjacent to the marsh consist of: (1) relocation of a 250-foot-long, 20-foot-wide segment of the VSR along the upper edge of the tidal marsh southeast of Runway 1R; and (2) removal and replacement of the five outfall pipes north of the Millbrae Highline Canal tide gate. Relocation of the VSR will result in the permanent loss of 0.04 acre of tidal marsh habitat for clapper rails. Although the area to be filled is considered relatively marginal clapper rail habitat due to adjacent disturbance, low vegetation density, and limited middle and high marsh zones, the conversion of a small portion of the existing

tidal marsh to a paved service road slightly reduces the extent of available foraging, roosting, and nesting habitat for the local California clapper rail population. The VSR relocation and outfall pipe replacement work is not expected to result in the destruction or disturbance of active California clapper rail nests since this work will occur outside the California clapper rail breeding season.

In addition to the permanent impact of the VSR relocation work on California clapper rail habitat, the proposed action may have temporary construction-related impacts on California clapper rails through increased levels of disturbance. Increased levels of disturbance to California clapper rails may result from noise, light and/or vibrations from equipment and construction activities in the marsh (i.e., during VSR relocation and outfall pipe replacement activities) and on the airfield. Operation of construction equipment in and adjacent to the marsh may result in displacement of California clapper rails from protective cover and their territories. These disturbances may disrupt normal behavior patterns of breeding, foraging, sheltering, and dispersal, but such effects are expected to be short in duration and limited in frequency. Displaced California clapper rails may have to compete for resources in occupied habitat and may be subject to increased predation, competition, mortality, and reduced reproductive success.

Implementation of the proposed action will result in approximately 10 acres of suitable California clapper rail habitat southeast of Runway 1R being temporarily subject to increased noise, light, and other construction-related disturbance associated with project implementation. The 10-acre estimate consists of all tidal marsh habitat within 700 feet of the airfield near Runway 1R. However, given the ongoing noise levels and disturbance associated with active airfield operations, nearby traffic on Millbrae Avenue and Highway 101, and use of the Bay Trail segment through Bayfront Park, it is expected that California clapper rails occurring in the tidal marsh are somewhat tolerant of moderate noise levels and disturbance. As such, implementation of the proposed action is not expected to appreciably contribute to the level of existing disturbance to California clapper rails in the vicinity of the proposed action. Furthermore, permanent and temporary effects will be offset through the purchase of tidal wetland habitat from the Deepwater Slough Island Wetland Mitigation Project in Redwood City which will preserve 0.20 acre of California clapper rail habitat in perpetuity.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions affecting listed species and their critical habitat that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Future SFO projects that are reasonably certain to occur in or adjacent to the action area include the following: (1) SFO Replacement Airport Traffic Control Tower (ATCT) Project; and (2) Reclaimed Water System Project. The ATCT Project proposes to construct a replacement ATCT facility. A seismic evaluation of the structurally integrated ATCT facility and the Terminal 2

building in 2006 concluded extensive upgrades were required for the building and ATCT facilities to meet current seismic, building, and fire code standards and that damage from a major earthquake would render the ATCT (and SFO) inoperable. The Replacement ATCT is located in the paved airport operations area approximately 3,800 feet northwest of the tidal salt marsh habitat that would be disturbed by the relocation of the VSR. The Replacement ATCT is separated from the tidal marsh habitat by Runway 1L-19R, Runway 1R-19L, and the VSR. The Reclaimed Water System Project proposes to treat the secondary effluent produced at SFO's wastewater treatment plant to meet the requirements of Title 22 water for reuse as nonpotable water throughout SFO. This project will involve installation of underground pipelines to distribute treated water, construction of tertiary and advanced treatment facilities, and installation of irrigation pipelines along the McDonnell Road corridor. This project would be subject to separate and ongoing environmental review.

Elements of these projects, which create noise, degrade water quality, or destroy habitat, could have effects on California clapper rails in the region when considered collectively. For the purpose of this cumulative impacts evaluation, potentially deleterious elements of these projects could include the following potential effects: noise from building, construction, and demolition if it occurs adjacent to tidal marsh habitat, or degradation of water quality from construction, demolition, and/or other associated improvement projects, inadvertent invasive weed introductions and control efforts, anthropogenic fire ignitions, introduction of pets such as dogs and cats that could prey upon California clapper rails, changes in local drainage/hydrology from irrigation runoff or new land use, and impacts from future airfield operations, infrastructure improvements and maintenance activities. These projects will, at a minimum, be subject to local environmental review and evaluation under applicable state and/or federal requirements. As such, project-specific measures to avoid, minimize, and/or compensate for these effects will be developed under state environmental review processes where appropriate.

Conclusion

After reviewing the current status of the California clapper rail, the environmental baseline for the action area, the effects of the proposed action and cumulative effects, it is the Service's biological opinion that the proposed RSA Project at SFO in San Mateo County, California, is not likely to jeopardize the continued existence of the California clapper rail. We base this conclusion on the expected successful implementation of several conservation measures designed to avoid and minimize adverse effects to California clapper rail from the proposed action construction activities. In addition, the purchase of 0.20 acre of constructed tidal marsh habitat at the Deepwater Slough Island Wetland Mitigation Project is considered sufficient to mitigate for permanent impacts to 0.04 acre of tidal marsh (i.e., 5:1 mitigation ratio) and temporary construction-related effects associated with project implementation. No critical habitat has been proposed or designated for this species, therefore none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9(a)(1) of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the federal Endangered Species Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The FAA has a continuing duty to regulate the activity covered by this incidental take statement. If the FAA: (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document; and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

Conservation measures proposed by the project proponent and described above in the *Description of the Proposed Action* section of this biological opinion will reduce, but do not eliminate, the potential for incidental taking of California clapper rail. The Service anticipates incidental take of clapper rails will be difficult to detect or quantify because of the variable, unknown size of the resident population over time, and the shy nature of the California clapper rail. Due to the difficulty in quantifying the number of clapper rails that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of acres of habitat that will be lost as a result of the proposed action. Therefore, the Service anticipates that 0.04 acre of suitable clapper rail habitat will be lost as a result of the proposed action.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the impact of take on California clapper rail:

1. The project proponent shall implement the proposed action, including proposed conservation measures, as described in the *Description of the Proposed Action* of this biological opinion, unless modified by terms and conditions contained in the biological

opinion.

2. The project proponent shall minimize adverse effects to the California clapper rail.

3. The project proponent shall ensure their compliance with this biological opinion.

Terms and Conditions

To be exempt from the prohibitions of section 9 of the federal Endangered Species Act, the FAA shall comply with the following terms and conditions, which implement the reasonable prudent measures described above. These terms and conditions are nondiscretionary.

The following terms and conditions implement Reasonable and Prudent Measures 1 and 2:

1. The FAA shall minimize the potential for harm or harassment of California clapper rail resulting from the proposed action by implementing the proposed action, including proposed conservation measures, as described in the *Description of the Proposed Action* of this biological opinion, with the inclusion of or modifications by the following Terms and Conditions of this biological opinion for the proposed action.

2. The FAA shall include Special Provisions that incorporate the Proposed Conservation Measures and the Terms and Conditions of this biological opinion in the solicitation for bid information. In addition, the FAA shall inform all contractors and subcontractors involved in the proposed action about the requirements of this biological opinion.

3. The biologist(s) proposed by the FAA to conduct environmental awareness training for all contractor and subcontractor personnel prior to entry to the VSR relocation and outfall pipe replacement work areas shall be approved by the Service. The biologist(s) shall be experienced with and knowledgeable about California clapper rail. This training shall review sensitive biological resources (e.g. California clapper rail, jurisdictional wetlands) at the site and shall identify all protection measures to be implemented and complied with to ensure that these resources are not affected by work activities. New employees shall attend a training session prior to participating in work activities.

The following terms and conditions implement Reasonable and Prudent Measure 3:

1. If requested, before, during, or upon completion of any work activities in the action area, the FAA shall coordinate, through appropriate SFO airfield staff, to allow for access by Service personnel to the work areas to inspect effects of the proposed action to the California clapper rail and its habitat.

2. The FAA shall submit a post-project compliance report prepared by a Service-approved biologist(s) to the Service's Sacramento Fish and Wildlife Office within sixty (60) calendar days following completion of the VSR relocation and outfall pipe replacement

work or within sixty (60) calendar days of any break in work activities lasting more than sixty (60) calendar days. This report shall detail (i) dates that construction occurred; (ii) pertinent information concerning the success of the proposed action in meeting the Proposed Conservation Measures and Terms and Conditions of this biological opinion; (iii) an explanation of any failure to meet such measures; (iv) known project effects on the California clapper rail, if any; (v) occurrences of incidental take of this listed species; (vi) documentation of employee environmental awareness training; and (vii) other pertinent information. The reports shall be addressed to the Deputy Field Supervisor of the Endangered Species Program in the Service's Sacramento Fish and Wildlife Office.

3. The FAA shall comply with all reporting requirements in this biological opinion.

Reporting Requirements

The Service must be notified within 24 hours of the finding of any dead or injured California clapper rails, or any unanticipated damage to their habitat associated with the proposed action. Injured clapper rails shall be cared for by a licensed veterinarian or other qualified person, such as the Service-approved biologist for the proposed action. Notification must include the date, time, and precise location of the specimen/incident, and any other pertinent information. Dead animals should be sealed in a zip lock bag containing a piece of paper indicating the location, date and time when it was found, and the name of the person who found it; and the bag should be frozen in a freezer in a secure location. The Service contact persons are Coast Bay/Forest Foothills Division Chief, Endangered Species Program, at the Sacramento Fish and Wildlife Office at telephone (916) 414-6600 and Resident Agent-in-Charge of the Service's Law Enforcement Division at telephone (916) 414-6660.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species, habitat, implementation of recovery actions, or development of information and databases.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations. We propose the following conservation recommendations:

1. Assist the Service in implementing recovery actions identified within most current recovery plan for the California clapper rail (Service 2010).

2. Encourage or require the use of appropriate California native plant species in revegetation and habitat enhancement efforts associated with projects authorized by or carried out by

the FAA.

3. Encourage the FAA's participation in a program being implemented by federal and State resource agencies to limit and reverse the spread of non-native *Spartina* within the San Francisco Bay Estuary.

REINITIATION STATEMENT

This concludes formal consultation on the proposed RSA Improvement Program at SFO. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount of extent of incidental take is exceeded; (2) new information reveal effects of the proposed action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion; or (4) a new species or critical habitat is designated that may be affected by the proposed action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding this opinion on the proposed RSA Improvement Program at SFO. Please contact Andrew Raabe or Ryan Olah, Coast Bay/Forest Foothills Division Chief, at the letterhead address, telephone (916) 414-6600, or electronic mail at Andrew_Raabe@fws.gov or Ryan_Olah@fws.gov.

Sincerely,

Susan K. Moore

Susan K. Moore
Field Supervisor

cc:
Scott Wilson, California Department of Fish and Game, Yountville, California

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APPENDIX F
COORDINATION AND PUBLIC INVOLVEMENT DOCUMENTATION

Appendix F1
Early Coordination and Public Involvement Documentation

Sample Early Notification Letter

San Francisco International Airport

P.O. Box 8097
San Francisco, CA 94128
Tel 650.821.5000
Fax 650.821.5005
www.flysfo.com

November 15, 2010

Mr. Aaron Aknin, AICP
Community Development Director
City of San Bruno
Community Development Department
567 El Camino Real
San Bruno, California 94125

Subject: ***Runway Safety Area Improvement Program, San Francisco International Airport***

Dear Mr. Aknin:

The San Francisco Airport Commission is planning to implement a Runway Safety Area (RSA) Program for the San Francisco International Airport (SFO or Airport). The RSA improvements are required to comply with Public Law 109-115, which states that "*not later than December 31, 2015, the owner or operator of an airport certificated under 49 United States Code 44706 shall improve the airport's RSAs to comply with the Federal Aviation Administration (FAA) design standards required by 14 Code of Federal Regulations Part 139*" (Public Law 109-115, November 30, 2005 [119 STAT. 2401]). The applicable requirements are included in FAA Order 5200.8, *Runway Safety Area Program*, and FAA Advisory Circular 150/5300-13, *Airport Design*. The intent of the RSA Program is to enhance safety in the event that an aircraft undershoots, overruns, or veers off the runway, and to provide greater accessibility for firefighting and rescue equipment during such incidents.

Two separate environmental documents will be prepared concurrently for the RSA Program. An Environmental Assessment (EA) will be prepared in accordance with the National Environmental Policy Act (NEPA); the Council on Environmental Quality Regulations (40 Code of Federal Regulations 1500-1509); FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*: and FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*. In addition, a separate Initial Study (IS) will be prepared pursuant to the California Environmental Quality Act (CEQA) (California Public Resources Code Section 21000 et seq.); State CEQA Guidelines (California Administrative Code Title 14 Section 15000 et seq.); and Chapter 31 of the San Francisco Administrative Code.

The overall RSA Program includes a number of improvements to bring the RSAs into conformance with criteria specified in FAA Advisory Circular 150/5300-13, *Airport Design*. The improvements include shifting some runways while maintaining existing runway lengths, constructing Engineered Materials Arresting Systems (EMAS) where standard RSAs cannot

reasonably be constructed, and using "declared distances" for several runways. Declared distances involve designating specific lengths of runway pavement to be available for use by pilots in planning takeoffs or landings on or from the runway, allowing the remaining portion of that runway pavement to be designated as part of the RSA. The project also includes additional components that are discussed in the attached project description and shown in the accompanying figures.

This early notification of the intent to prepare an EA and IS for the RSA Program is being sent to you for the following reasons:

1. To advise your agency or organization of the preparation of the EA and IS;
2. To request any relevant information that your agency or organization may have regarding SFO's RSAs or environs; and
3. To solicit early comments regarding potential environmental, social, and economic issues for consideration during the preparation of the EA and IS.

You may send any information and comments to the San Francisco Planning Department's assigned staff contact, Irene Nishimura, at the address provided below. Comments should include your return mailing address and email address so that you can be notified as information about the project becomes available.

Irene Nishimura
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
Email: irene.nishimura@sfgov.org

Your prompt response is appreciated. We would like to thank you for your interest in this project and look forward to working with you as we prepare the EA and IS. If you have any questions or need additional information regarding the proposed project, please do not hesitate to contact me at (650) 821-7844.

Sincerely,

Audrey Park
Bureau of Planning and Environmental Affairs
San Francisco International Airport

Attachments
Project Description
Figures

cc: Lisa Costa Sanders, City of San Bruno, Acting Planning Manager

SAN FRANCISCO INTERNATIONAL AIRPORT
RUNWAY SAFETY AREA PROGRAM
ENVIRONMENTAL ASSESSMENT AND INITIAL STUDY

DESCRIPTION OF PROPOSED PROJECT

PROJECT BACKGROUND AND PURPOSE

The San Francisco International Airport (SFO or Airport) is located in unincorporated San Mateo County, west of Interstate 101, near the cities of South San Francisco, San Bruno, and Millbrae. The Airport is within the jurisdiction of the City and County of San Francisco. The San Francisco Airport Commission is proposing to implement the Runway Safety Area (RSA) Program, which involves enhancing the RSAs of Runways 10L-28R, 10R-28L, 1R-19L, and 1L-19R to improve safety.

The purpose of the SFO RSA Program is to improve the existing RSAs at the Airport to comply with Public Law 109-115, which states that *"not later than December 31, 2015, the owner or operator of an airport certificated under 49 United States Code 44706 shall improve the airport's RSAs to comply with the Federal Aviation Administration (FAA) design standards required by 14 Code of Federal Regulations Part 139"* (Public Law 109-115, November 30, 2005 [119 STAT. 2401]).

RSAs are clear areas around a runway, free of objects and structures; they are designed and maintained to enhance safety in the event that an aircraft undershoots, overruns, or veers off the runway, and to provide greater accessibility for firefighting and rescue equipment during such incidents. The applicable requirements for RSAs are included in FAA Advisory Circular 150/5300-13, *Airport Design;* and FAA Order 5200.8, *Runway Safety Area Program.*

Many airports were built before the current RSA standards were adopted, and achieving the required RSAs beyond the end of runways can be challenging due to such obstacles as water bodies, highways, or populated areas. For an airport serving the types of aircraft commonly using SFO, FAA Advisory Circular 150/5300-13, *Airport Design* establishes the following standard RSA dimensions:

- Width: **500 feet**
- Length prior to each landing threshold: **600 feet**
- Length beyond each runway end: **1,000 feet**

Because all runways at SFO can be used in either direction depending on wind conditions, the standard for RSAs extending 1,000 feet at each end of each runway is applicable.

The dimensions and key deficiencies of the existing RSAs at SFO are summarized in Tables 1 and 2.

Table 1
Summary of Existing Runway Safety Area Conditions – Runways 1L-19R and 1R-19L

Runway	RSA Available Length from Runway End[1] (feet)	Meets FAA Standards	Deficiency (feet)
1L	609	No	391
1R	777	No	223
19L	246	No	754
19R	177	No	823

Note:
1 All RSAs are 500 feet wide

Table 2
Summary of Existing Runway Safety Area Conditions – Runways 10L-28R and 10R-28L

Runway	RSA Available Length from Runway End[1] (feet)	Meets FAA Standards	Deficiency (feet)
10L	1,000	Yes[2]	N/A
10R	1,000	Yes[2]	N/A
28L	324	No	676
28R	322	No	678

Notes:
1 All RSAs are 500 feet wide
2 The existing RSAs of Runways 10L and 10R are substandard due to existing navigational aids (made out of nonfrangible materials) located within the standard dimensions of the RSAs.

PROJECT ELEMENTS

RSA studies were completed for SFO in June 2010 to identify and evaluate alternatives for bringing the RSAs into conformance with criteria specified in FAA Advisory Circular 150/5300-13, *Airport Design*. The RSA studies include a recommended practicable RSA improvement alternative for each of the four runways at SFO, along with associated changes in lighting and navigation aids such as approach lighting. The proposed improvements involve a combination of runway shifts and other improvements, and are located in four geographic locations (at the two ends of each pair of parallel runways). The project components are listed below and are illustrated in the attached exhibits.

It is not practicable to create RSAs for Runways 1L-19R and 1R-19L that meet the applicable standards because of the position of the runways relative to San Francisco Bay and Interstate 101. An Engineered Materials Arresting System (EMAS) is proposed to be installed at these runway ends to enhance the RSAs. An EMAS is a specialized system installed in the RSA beyond the runway end, made of high-energy absorbing materials. When an aircraft overruns the runway, these materials are crushed, absorbing the force of the aircraft and decelerating and arresting the aircraft's movement.

The RSA Program also includes use of "declared distances" for several of the runways. Declared distances involve the designation of specific lengths of runway pavement that are available for use by pilots in planning takeoffs or landings using that runway. These designations allow remaining portions of the runway pavement to be designated as part of the RSA. Declared distances proposed as part of the RSA Improvement Program include Takeoff Run Available, Takeoff Distance Available, Accelerate Stop Distance Available, and Landing Distance Available.

The overall RSA Program also includes a number of related components such as demolition of an existing electrical substation building, new underground drainage installations and pump stations, relocation of runway and taxiway lights and signage, relocation of an electrical substation, and modifications to existing navigation aids.

Runways 1L-19R and 1R-19L

- Shift Runway 1L-19R 450 feet to the south by extending the runway pavement at the south end of the runway by 450 feet and reducing the north end of the runway by a similar distance, thus maintaining the existing runway length.

- Shift Runway 1R-19L 205 feet to the south by extending the runway pavement at the south end of the runway by 205 feet and reducing the north end of the runway by a similar distance, thus maintaining the existing runway length.

- Construct an EMAS bed approximately 550 feet long north of the Runway 19R threshold, with a 50-foot setback from the runway end.

- Construct an EMAS bed approximately 440 feet long north of the Runway 19L threshold, with a 35-foot setback from the runway end.

- Construct an EMAS bed approximately 510 feet long south of the Runway 1L threshold, with a 35-foot setback from the runway end.

- Construct an EMAS bed approximately 380 feet long south of the Runway 1R threshold, with a 35-foot setback from the runway end.

- Demolish the existing pavement of Taxiway E and Taxiway L and replace/realign the taxiways to provide access to the relocated threshold of Runways 19L and 19R.

- Relocate portions of the approach lighting for Runway 19L to accommodate the relocated landing threshold.

- Demolish portions of the existing Taxiway A pavement and construct a realigned Taxiway A extending between Taxiway B and Taxiway L around the south side of the new EMAS installations at the south end of the runways.

- Construct a new taxiway between Taxiway B, Runway 1L threshold, Runway 1R threshold, and Taxiway L, with a mid-field connection to the relocated Taxiway A.

- Relocate an existing electrical substation

- Relocate the existing vehicle service road and blast fence south of relocated Taxiway A and Runways 1R-19L and 1L-19R adjacent to Interstate 101.

- Construct a new bridge and box culvert over the Millbrae Highline Canal for a taxiway shoulder and realigned vehicle service road, blast fence, and airport operating area fence.

- Fill and/or reconfigure the South Oxidation Pond, Bird Ball Ditch, and associated stormwater ponds for construction of the new taxiways, relocation of the vehicle service road, and installation of a new pump station.

Runways 10L-28R and 10R-28L

- Displace the landing thresholds for Runways 28L and 28R by 300 feet to the west and relocate glide slope navigation aids.

- Implement declared distances for Runways 10L-28R and 10R-28L.

- Relocate portions of the approach lighting installations for Runways 28L and 28R.

- Extend the Runway 10R-28L pavement by 771 feet west to preserve the existing Runway 10R takeoff capability.

- Relocate the existing localizer antenna for Runway 28L.

- Construct a new taxiway connection between Taxiway S, the relocated threshold of Runway 10R, and Taxiway Z.

LEGEND

Map Extents

N

0 1,000 2,000 FEET

SFO RSA KEY MAP

San Francisco International Airport
RSA Program
San Francisco, California

October 2010
28067849

FIGURE 1

U:\GIS\SFO_RSA\Projects\Fig_1_SFO_overview.mxd 10/27/2010 11:53:44 AM

LEGEND

- Relocated Blast Fence
- Relocated Vehicle Service Road
- EMAS
- New Runway Pavement[1]
- New Taxiway
- Other New Asphalt Concrete

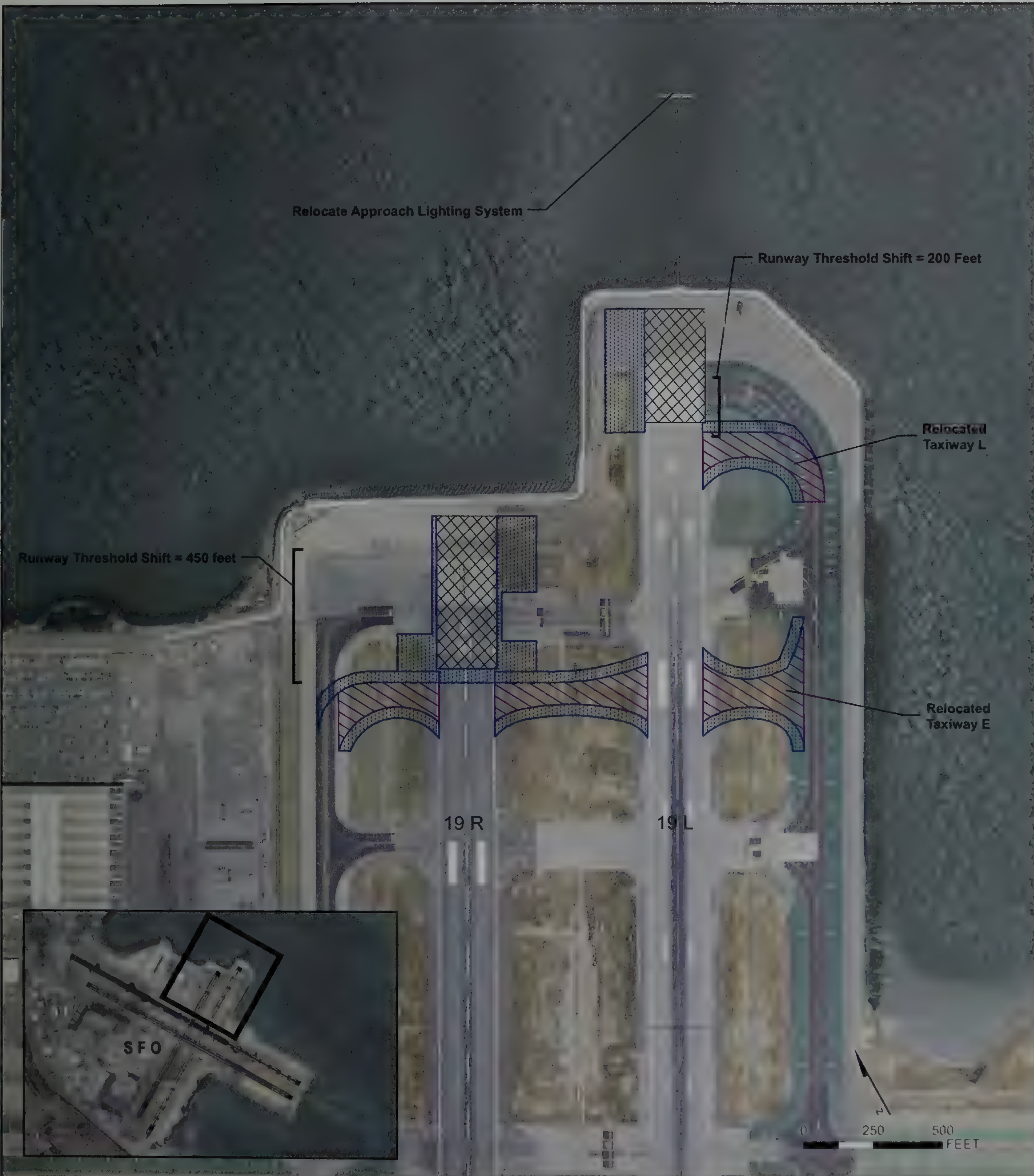
Note:
1. To maintain existing runway length

RSA IMPROVEMENTS - RUNWAYS 1R-19L AND 1L-19R (SOUTH END)

October 2010
28067849

San Francisco International Airport
RSA Program
San Francisco, California

FIGURE 2



LEGEND

- EMAS
- New Taxiway
- Other New Asphalt Concrete

RSA IMPROVEMENTS - RUNWAYS 1R-19L AND 1L-19R (NORTH END)

October 2010
28067849

San Francisco International Airport
RSA Program
San Francisco, California

FIGURE 3

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LEGEND

New Runway Pavement [1]

New Taxiway

Other New Asphalt Concrete

Note
1 To maintain existing usable runway length

RSA IMPROVEMENTS - RUNWAYS 10R-28L AND 10L-28R (WEST END)

San Francisco International Airport
RSA Program
San Francisco, California

October 2010
28067849

FIGURE 4

RSA IMPROVEMENTS - RUNWAYS 10R-28L AND 10L-28R (EAST END)

October 2010
28067849

San Francisco International Airport
RSA Program
San Francisco, California

FIGURE 5

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Runway Striping
RSA
EMAS
New Runway Pavement

Notes:
ASDA = Accelera
LDA = Landing D
RSA = Runway S
Rwy = Runway
TODA = Takeoff D
TORA = Takeoff R

LAYOUT PLAN - RUNWAYS 1R-19L AND 1L-19R

October 2010
28067849

San Francisco International Airport
RSA Program
San Francisco, California

FIGURE 6

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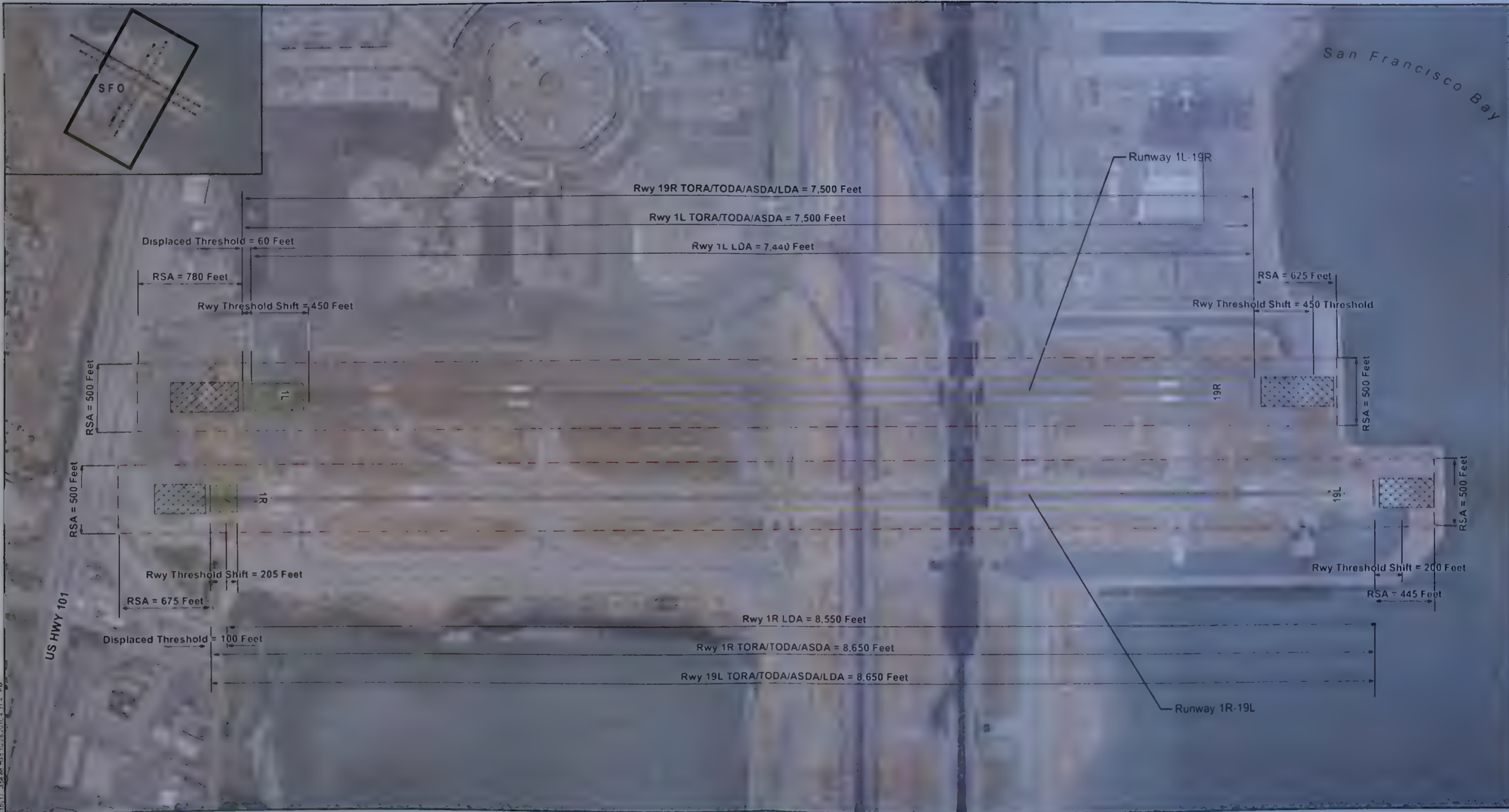


Runway Striping
RSA
EMAS
New Runway Pavement

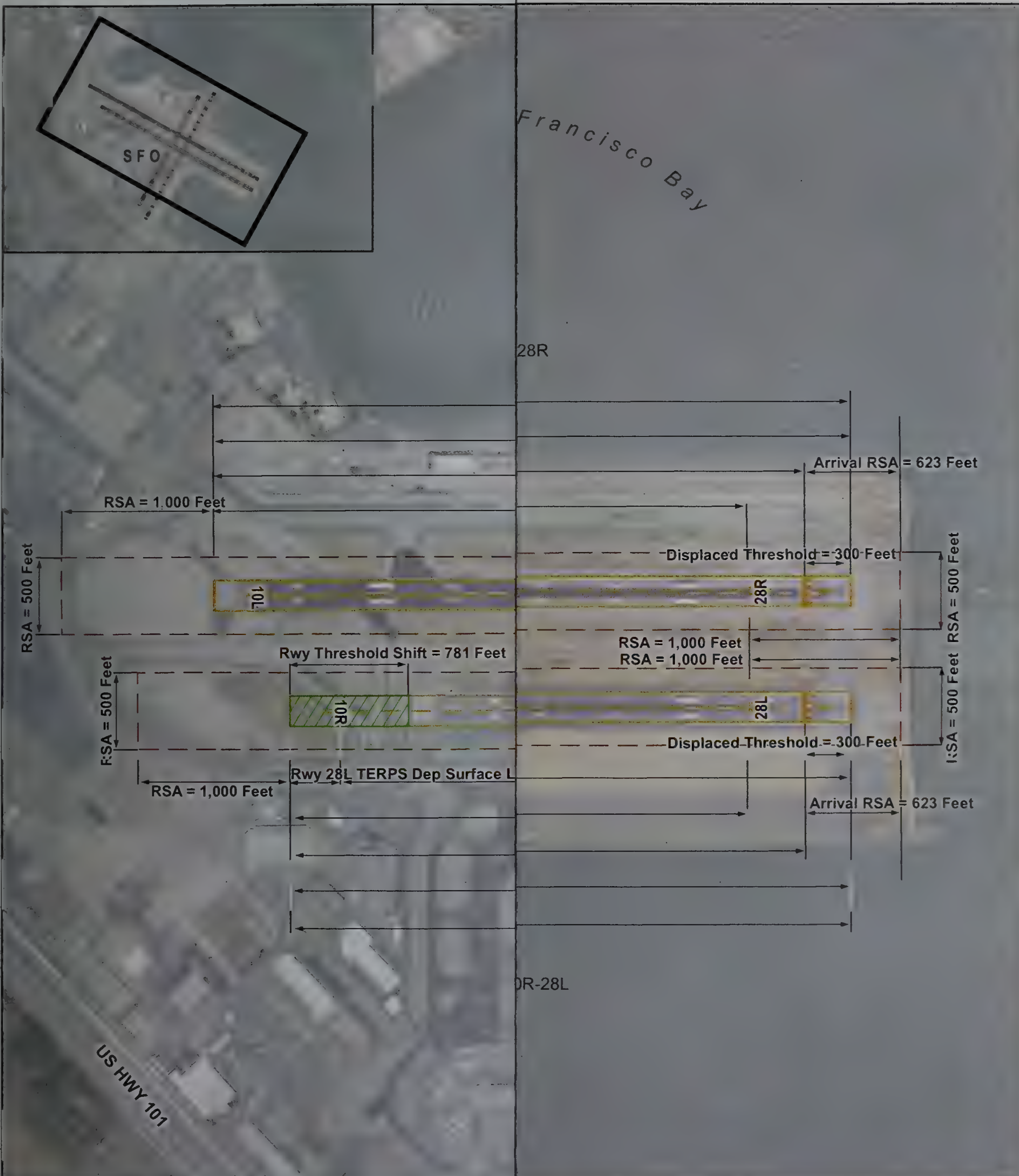
Notes
ASDA = Accelerate Stop Distance Available
LDA = Landing Distance Available
RSA = Runway Safety Area
Rwy = Runway
TODA = Takeoff Distance Available
TORA = Takeoff Run Available

LAYOUT PLAN - RUNWAYS 1R-19L AND 1L-19R

San Francisco International Airport
RSA Program
San Francisco, California

October 2010
28067849

FIGURE 6



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Runway Striping

RSA

New Runway Pavement

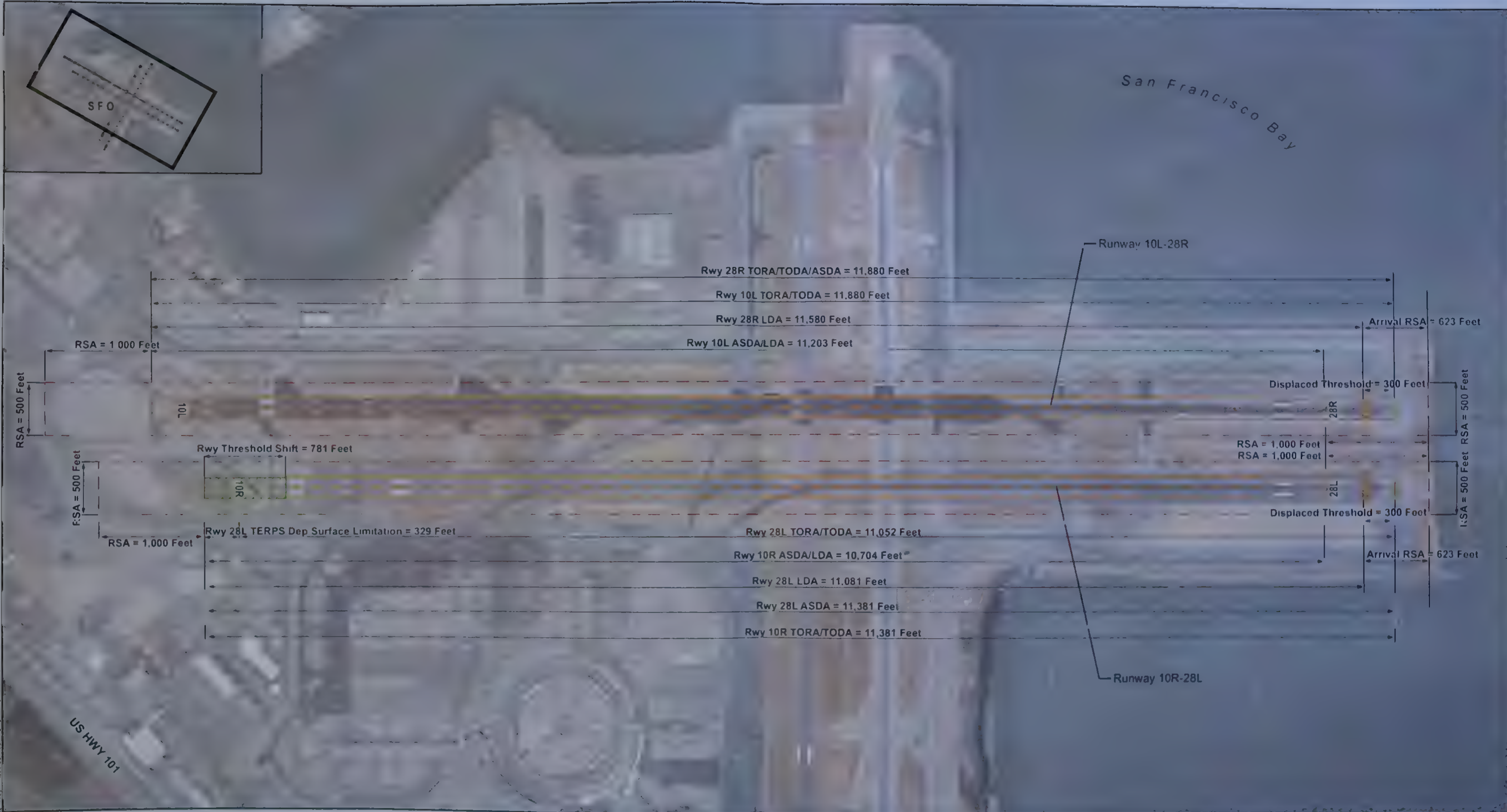
Notes:
ASDA = Accelera
Dep = Departure
LDA = Landing D
RSA = Runway S
Rwy = Runway
TERPS = Termina
TODA = Takeoff D
TORA = Takeoff F

LAYOUT PLAN - RUNWAYS 10R-28L AND 10L-28R

October 2010
28067849

San Francisco International Airport
RSA Program
San Francisco, California

FIGURE 7



Runway Striping
RSA
New Runway Pavement

Notes
ASDA = Accelerate Stop Distance Available
Dep = Departure
LDA = Landing Distance Available
RSA = Runway Safety Area
Rwy = Runway
TERPS = Terminal Instruments Procedures
TODA = Takeoff Distance Available
TORA = Takeoff Run Available

0 450 900 FEET

LAYOUT PLAN - RUNWAYS 10R-28L AND 10L-28R

October 2010
28067849

San Francisco International Airport
RSA Program
San Francisco, California

FIGURE 7

Mailing List for Early Notification Letter

Mr. Aaron J. Aknin, AICP
Community Development Director
City of San Bruno
567 El Camino Real
San Bruno, California 94125
cc: Lisa Costa Sanders, Acting Planning Manager

Mr. Charles Armor
Regional Manager
California Department of Fish and Game
(Region 3, Bay Delta Region)
7329 Silverado Trail
Napa, California 94558
cc: Mr. Greg Martinelli
cc: Ms. Suzanne Gilmore

Mr. Terry Barrie
California Department of Transportation - Division of Aeronautics, MS 40
Office of Aviation Planning
P. O. Box 942874
Sacramento, California 94274
cc: Mr. Philip Crimmins, Caltrans Division of Aeronautics
cc: James B. Richards, Caltrans District 4

Mr. Richard Berger
Manager of Economic and Community Development
City of Daly City
333 90th St.
Daly City, California 94015

Mr. Nova Blazej
Manager, Environmental Review Office
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, California 94105
cc: Ms. Melissa Scianni, USEPA Water Division
cc: Mr. Robert Hargrove, USEPA NEPA Compliance

Mr. Jack Broadbent
Executive Officer
SF Bay Area Air Quality Management District
939 Ellis St
San Francisco, California 94109
cc: Ms. Jean Roggenkamp, Deputy Air Pollution Control Officer
cc: Dr. Jeff McKay, Deputy Air Pollution Control Officer

Ms. Stacy Cocke
Senior Planner
Capital Project and Environmental Planning
San Mateo County Transit District
P.O. Box 3006
San Carlos, California 94070

Mr. Steve Edmondson
Area Office Supervisor
Habitat Conservation Division
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
(Southwest Regional Office)
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404
cc: Mr. Gary Stern
cc: Ms. Korie Schaeffer
cc: Ms. Lael A. Will

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer
Office of Historic Preservation
P.O. Box 942896
Sacramento, California 94296
cc: Mr. Tristan Tozer

Mr. Jim Eggemeyer
Director
San Mateo County
Department of Planning and Building
County Office Building
455 County Center, 2nd Floor
Redwood City, California 94036

Ms. Ann Flemer
Deputy Executive Director, Policy
Metropolitan Transportation Commission
Joseph P. Bort Metro Center,
101 Eighth St.
Oakland, California 94607
cc: Mr. Doug Kimsey, Planning Manager

Ms. Lisa Grote
Director of Community Development
City of San Mateo
330 West 20th Avenue
San Mateo, California 94403

Mr. Robert Hargrove
Director of NEPA Compliance Division
US Environmental Protection Agency, Office of Federal Actions [Mail code 2251A]
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460
cc: Mr. Nova Blazej, USEPA Region 9
cc: Ms. Melissa Scianni, USEPA Region 9

Jackie Jacobberger
President
League of Women Voters of North and Central San Mateo County
444 Peninsula Avenue, Suite 1
San Mateo, California 94401

Ms. Ellen Johnck
Executive Director
Bay Planning Coalition
10 Lombard Street, Suite 408
San Francisco, California 94111

Mr. Kenneth Kirkey
Planning Director
Association of Bay Area Governments
P.O. Box 2050
Oakland, California 94604

Shin-Roei Lee
Chief - Watershed Management Division
California Regional Water Quality Control Board
San Francisco Bay Region 2, Watershed Management Division
1515 Clay Street, Suite 1400
Oakland, California 94612
cc: Ms. Sandi Potter

Mr. David Lewis
Executive Director
Save the Bay
350 Frank Ogawa Plaza, Suite 900
Oakland, California 94612

Mr. Jeremy Madsen
Executive Director
Greenbelt Alliance
631 Howard Street, Suite 510
San Francisco, California 94105

Mr. Richard Marks
Community Development Department Director
City of Foster City
610 Foster City Blvd.
Foster City, California 94404

Mr. William Meeker
Community Development Director
City of Burlingame
501 Primrose Rd.
Burlingame, California 94010
cc: Ms. Maureen Brooks, Planning Manager

Sonny Mencher
President
Sequoia Audubon Society
P.O. Box 620292
Woodside, California 94062

Mr. Farhad Mortazavi
Community Development Director
City of Millbrae
621 Magnolia Ave.
Millbrae, California 94030
cc: Mr. David Petrovich, City Planner
cc: Mr. Ron Popp, Director of Public Works
cc: Mr. Mike Riddell, Public Works Superintendent
cc: Mr. Khee Lim, City Engineer

Mr. Richard Napier
Executive Director
City/County Association of Governments of San Mateo County (C/CAG)
San Mateo County Office Building, 555 County Center, Fifth Floor
Redwood City, California 94063
cc: David Carbone

Mr. David Carbone
SFO/Community Roundtable
1828 El Camino Real, Suite 705
Burlingame, California 94010
cc: Mr. Steven Alverson, Roundtable Consultant
cc: Mr. Bert Ganoung, SFO Noise Abatement
cc: Mr. Mike McCarron, SFO Community Affairs
cc: Mr. Sean Cullinane, FAA ATCT

Mr. Ryan Olah
Chief – Coastal Branch
US Fish and Wildlife Service (California and Nevada Region 8-Ecological Services)
2800 Cottage Way, Room W-2605
Sacramento, California 95825
cc: Mr. Andrew Raabe, Fish and Wildlife Biologist

Cy Oggins
Chief
Division of Environmental Planning and Management
California State Lands Commission
100 Howe Ave #100S
Sacramento, California 95825

Mr. Larry Reed
Chapter Director
Sierra Club, Loma Prieta Chapter
3921 East Bayshore Road, Suite 204
Palo Alto, California 94303

Mr. James B. Richards
Deputy District Director
Environmental Planning and Engineering
California Department of Transportation - District 4
P.O. Box 23660
Oakland, California 94623
cc: Terry Barrie, Caltrans Division of Aeronautics

Mr. Robert Smith
U.S. Army Corps of Engineers
San Francisco Office
1455 Market St., 16th Floor
San Francisco, California 94103

Mr. Will Travis
Executive Director
San Francisco Bay Conservation and Development Commission
50 California Street, Suite 2600
San Francisco, California 94111
cc: Mr. Joe LaClair, Chief of Planning
cc: Mr. Robert Batha, Chief of Permits
cc: Mr. Brad McCrea, Regulatory Program Director
cc: Mr. Max Delaney, Coastal Program Analyst

Mr. Marty van Duyn
Director of Economic and Community Development
City of South San Francisco
400 Grand Ave
South San Francisco, California 94080
cc: Ms. Susy Kaulkin, Chief Planner
cc: Mr. Gerry Beaudin, Principal Planner

Mr. Jim Wunderman
President and CEO
Bay Area Council
201 California Street, Suite 1450
San Francisco, California 94111

Natural Resources Defense Council
111 Sutter Street, 20th floor
San Francisco, California 94104

Executive Officer
U.S. Coast Guard
USCG Air Station
San Francisco International Airport Building 1020
San Francisco, California 94128

San Francisco Airport Commission
City Hall, 1 Dr. Carlton B. Goodlett Place, Room 400
San Francisco, California 94102
Honorable Larry Mazzola
Honorable Linda S, Crayton
Honorable Eleanor Johns
Honorable Richard J. Guggenhime
Honorable Peter A. Stern
cc: Jean Caramatti, Commission Secretary

City and County of San Francisco
Board of Supervisors
City Hall, 1 Dr. Carlton B. Goodlett Place, Room 244
San Francisco, California 94102
Supervisor Eric Mar, District 1
Supervisor Mark Farrell, District 2
Supervisor David Chiu, District 3
Supervisor Carmen Chu, District 4
Supervisor Ross Mirkarimi, District 5
Supervisor Jane Kim, District 6
Supervisor Sean Elsbernd, District 7
Supervisor Scott Wiener, District 8
Supervisor David Campos, District 9
Supervisor Malia Cohen, District 10
Supervisor John Avalos, District 11

Summary Notes of Meetings

Stakeholder	*Date*	*Attendees*
Corps Interagency Meeting	10/13/2010	Melissa Scianni, US Environmental Protection Agency Marla Lafer, San Francisco Regional Water Quality Control Board Bob Smith, US Army Corps of Engineers David B. Kessler, AICP, FAA Douglas Pomeroy, FAA LSA Associates, Inc. San Francisco International Airport
San Francisco Bay Development and Conservation Commission	11/8/2010	Bob Batha, Chief of Permits Joe LaClair, Chief Planner Lindy Lowe, Senior Planner and Supervisor Jaime Michaels, Principal Permit Analyst (invited but not available) LSA Associates, Inc. San Francisco International Airport
City of San Bruno	11/15/2010	Aaron Aknin, AICP, Community Development Director Lisa Costa Sanders, Acting Planning Director San Francisco International Airport
City/County Association of Governments – San Mateo County and SFO/Community Roundtable	11/16/2010	Richard Napier, Executive Director of C/CAG David Carbone, Transportation Systems Coordinator/Airport Environs Planning with C/CAG and Roundtable Program Manager San Francisco International Airport
City of South San Francisco	11/17/2010	Susy Kalkin, Chief Planner Gerry Beaudin, AICP, Senior Planner San Francisco International Airport
City of Burlingame	11/17/2010	William Meeker, Community Development Director Maureen Brooks, Planning Manager San Francisco International Airport
City of Millbrae (1 of 2)	11/24/2010	Fahrad Mortazavi, Community Development and Parks Director San Francisco International Airport
City of Millbrae (2 of 2)	12/1/2010	David Petrovich, City Planner Ron Popp, Public Works Director Mike Riddell, Superintendent of Public Works Khee Lim, City Engineer San Francisco International Airport

U.S. Army Corps of Engineers
San Francisco District
Regulatory Division

Interagency Meeting

Wednesday, October 13, 2010

1455 Market Street (btwn. 10th and 11th Streets)
Lobby Conference Room, 1st Floor
San Francisco CA 94103

To Whom It May Concern:

The Corps is holding its monthly interagency meeting on October 13, 2010. Enclosed is a description of the projects that will be reviewed. We invite a representative from your agency to attend so that they may hear a project presentation and offer feedback on the issues listed below or issues important to your agency.

The security in this building requires visitor passes to be requested a minimum of 24 hours prior to a meeting. Please indicate with an email or telephone call if a representative from your agency will attend, otherwise they may not be admitted into the building.

The agenda is as follows:

0900-1000
Project: Hacienda and Deep Gulch Remediation Project
Applicant/Consultant: County of Santa Clara, Parks and Recreation Department
Project Location: San Jose, Santa Clara County
Synopsis: Almaden Quicksilver County Park (AQSCP) was the site of mercury sulfide (cinnabar) mining from the mid 1800's to 1971. The Cinnabar ore was heated to release the mercury and what remained were piles of calcines or "roasted ore" mine tailings. After mining ended, piles of calcines remained in areas within AQSCP, including along slopes of Deep Gulch and Alamitos Creek. The proposed project would remove all visible calcine deposits at Hacienda and Deep Gulch areas within AQSCP, then consolidate and cap them at the "San Francisco Open Cut" portion of the Mine Hill Area of the AQSCP. Excavated calcines and associated soils would be directly transported by truck on the existing Mine Hill Trail or stock piled temporarily for transport to the open cut area.

1010-1110
Project: San Francisco International Airport Runway Safety Area Project
Applicant/Consultant: San Francisco International Airport, Planning and Environmental Affairs
Project Location: San Francisco International Airport, San Francisco County
Synopsis: In response to the mandate by the United States Congress that "*not later than December 31, 2015, the owner or operator of an airport certificated under 49 U.S.C. 44706 shall improve the airports Runway Safety Areas (RSA) to comply with the Federal Aviation Administration (FAA) design standards required by 14 Code of Federal Regulations (CFR) Part 139*", the purpose of the San Francisco International Airport (SFO) Runway Safety Area Project (RSA Project) is to bring SFO into compliance with the requirements of FAA Advisory Circular 150/5300-13, *Airport Design*, and FAA Order 5200.8, *Runway Safety Area Program*. The figure, entitled *Existing SFO Layout*, shows the location and current configuration of SFO's runways. In order to ensure the needs of the various airport users were considered, SFO convened a RSA Working Group to evaluate the RSAs for Runways 1L-19R, 1R-19L, 10L-28R and 10R-28L. A review of existing conditions shows that the RSA at the south end of Runway 1R-19L is limited by an Airport Operations Area (AOA) fence along the canal located approximately 777 feet beyond the runway end. At the north end, the RSA is limited by a service road, a sea wall and San Francisco Bay. A review of existing conditions shows that the RSA at the south end of Runway 1L-19R is limited by the South Detention Basin, approximately 609 feet from the Runway 1L end. At the north end of Runway 1L-19R the RSA is limited by a service road, a sea wall and San Francisco Bay. Therefore, the RSA project would involve modifications to all four runways.

1120-1220
Project: PG&E Shell Pond and Carbon Black Project
Applicant/Consultant: PG&E / CH2M Hill
Project Location: Bay Point, Contra Costa County
Synopsis: The Shell Pond is a 73-acre former wastewater pond within a 292-acre parcel owned by PG&E. The Shell Pond and the adjacent Carbon Black Area were constructed in the 1940s when levees were built to receive wastewater and stormwater from operations at the former Shell Oil Products Company plant and Hysol/Dexter, an adhesives manufacturer, both located to the south of the Shell Pond. PG&E acquired the property in 1973 and since the 1980s has conducted investigations, monitoring, and remedial activities at this site. The remainder of the parcel and surrounding property to the east and west is primarily estuarine wetlands. The proposed project would involve removal of the layer of non-native and mixed material that was deposited in the pond when it received wastewater discharges from the Shell Oil Products Company, and would include the following elements:

1) Materials would be transported and disposed at an offsite permitted facility
2) Covering unvegetated portions of the Carbon Black Area with clean soil and seeding the area
3) Removing material from the former wastewater discharge ditch leading to the Shell Pond and disposing of this material offsite

Questions and/or comments about the interagency meeting should be directed to Paula Gill at 415-503-6776 or by email at Paula.C.Gill@usace.army.mil or Bryan Matsumoto at 415-503-6786 or by email at Bryan.T.Matsumoto@usace.army.mil.

Agendas and Attendance Lists for Agency Meetings

Oakland and San Francisco International Airports
Runway Safety Area Improvement Project Meetings
January 20, 2011

Agenda

10:00 – 10:15	Introductions and Federal Aviation Administration Overview of Runway Safety Area (RSA) Improvement Program
10:15 – 10:30	San Francisco Airport RSA Improvement Project Presentation
10:30 – 11:00	Questions and Answers on San Francisco RSA Project
11:00 – 11:05	Break
11:05 – 11:20	Oakland Airport RSA Improvement Project Presentation
11:20 – 11:50	Questions and Answers on Oakland RSA Project
11:50 – 12:00	Wrap up

San Francisco Airport Runway Safety Area Program and

Oakland International Airport Runway Safety Area Improvement Project

US Fish and Wildlife Service Meeting

Sacramento, CA – January 20, 2010

MEETING ATTENDANCE SHEET

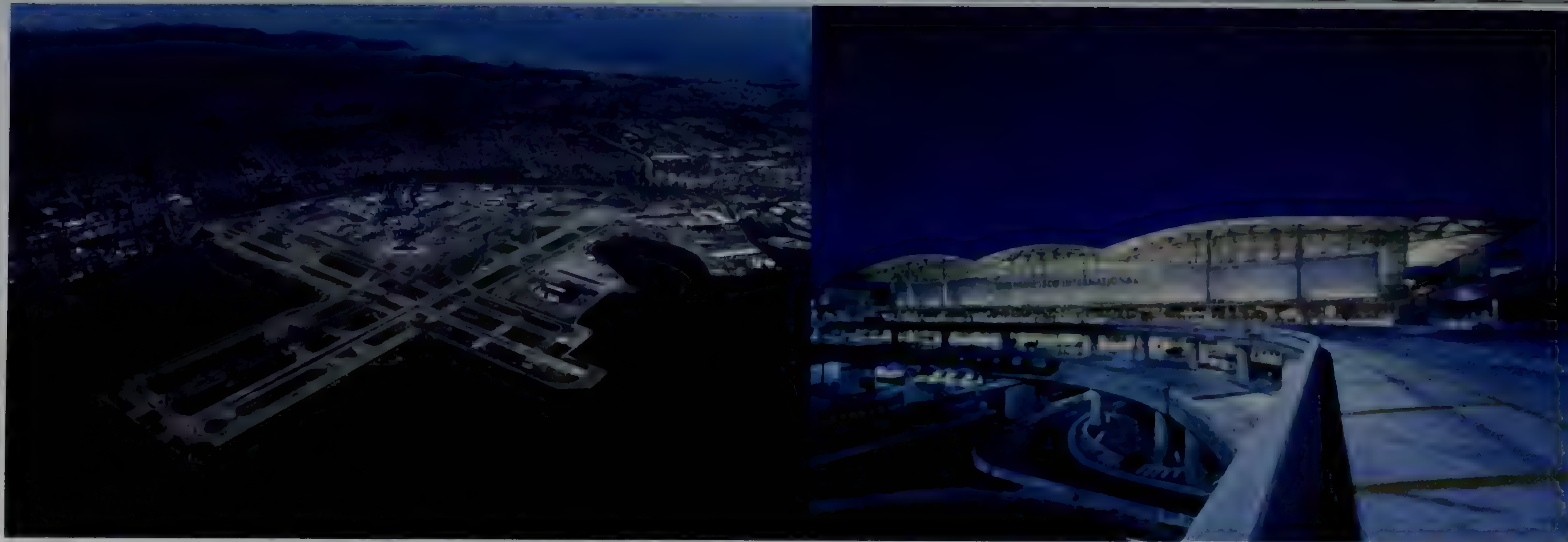
NAME	ORGANIZATION	PHONE	EMAIL
BILL FEHRING	URS	813 503 9180	bill_fehring@urscorp.com
Audrey Park	SFO Planning	650.821.7844	audrey.park@flysfo.com
COLLEEN LIANG	PORT OF OAKLAND	510-627-1198	cliang@portoakland.com
Nixon Lam	SFO Planning	650.821-5347	nixon.lam@flysfo.com
JOHN KIM	SFO PLANNING	650-821-7821	john.kim@flysfo.com
ODE BERNSTEIN	URS	510-421-2958	odebernstein@urscorp.com
Diane Heinze	Port of Oakland	510-627-1759	dheinze@portoakland.com
Lorena Solórzano-Vincent	URS	510-874-3114	Lorena_Solorzano-Vincent@URScorp.com
Joshua Polston	Port of Oakland	510.761.5422	Jpolston@portoakland.com
Ross Dobberteen	LSA	510/236-6810	Ross.Dobberteen@LSA-Assoc.com
Sean O'Brien	LSA	510/236-6810	Sean.OBrien@LSA-Assoc.com
Ryan Olah	USFWS	916-414-6623	ryan_olah@fws.gov
Andy Raabe	USFWS	916-414-6679	andrew_raabe@fws.gov
CHRISTOPHER WOLF	URS	415.243.3792	CHRISTOPHER_WOLF@URSCORP.COM
Doug Pomeroy	Federal Aviation Administration	650-876-2778 ext 612	douglas.pomeroy@faa.gov
DAVE Kessler	Federal Aviation Administration	310 725-3615	dave.kessler@FAA.gov

Oakland and San Francisco International Airports
Runway Safety Area Improvement Project Meetings
February 8, 2011

Agenda

10:00 – 10:15	Introductions and Federal Aviation Administration Overview of Runway Safety Area (RSA) Improvement Program
10:15 – 10:30	San Francisco Airport RSA Improvement Project Presentation
10:30 – 10:45	Questions and Answers on San Francisco RSA Project
10:45 – 10:50	Break
10:50 – 11:05	Oakland Airport RSA Improvement Project Presentation
11:05 – 11:25	Questions and Answers on Oakland RSA Project
11:25 – 11:35	Oakland Perimeter Dike Improvement Project
11:35 – 11:50	Questions and Answers on Oakland Dike Project
11:50 – 12:00	Wrap up

Sample Presentation for Agency Meetings



San Francisco International Airport

Runway Safety Area Improvement Program

November 17, 2010

Project Purpose and Need

- **Public Law 109-115** requires that:

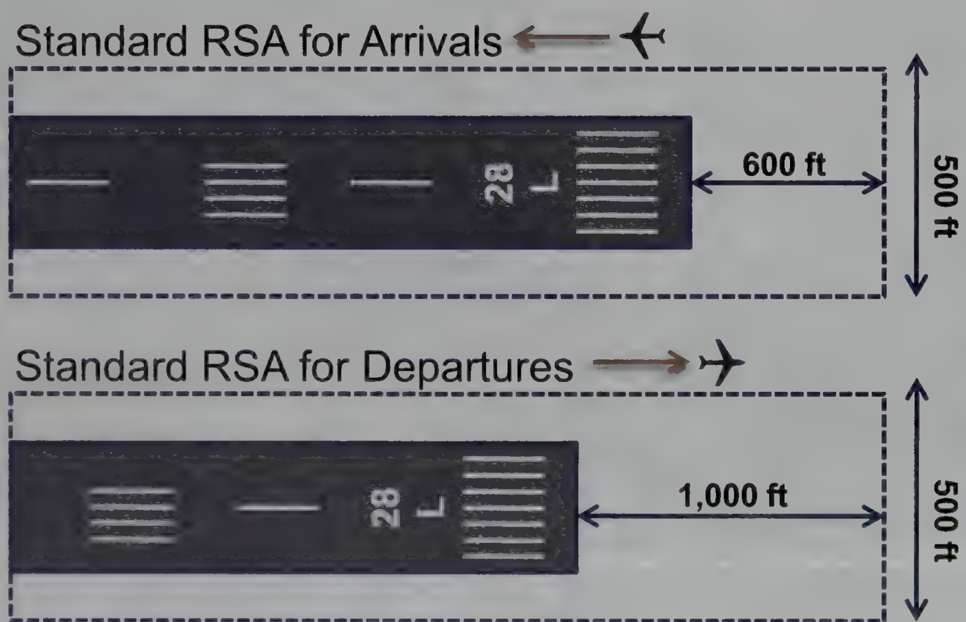
  "*not later than December 31, 2015, the owner or operator of an airport certificated under 49 United States Code 44706 shall improve the airport's RSAs to comply with the Federal Aviation Administration (FAA) design standards required by 14 Code of Federal Regulations Part 139*".
  (Public Law 109-115, November 30, 2005 [119 STAT. 2401])

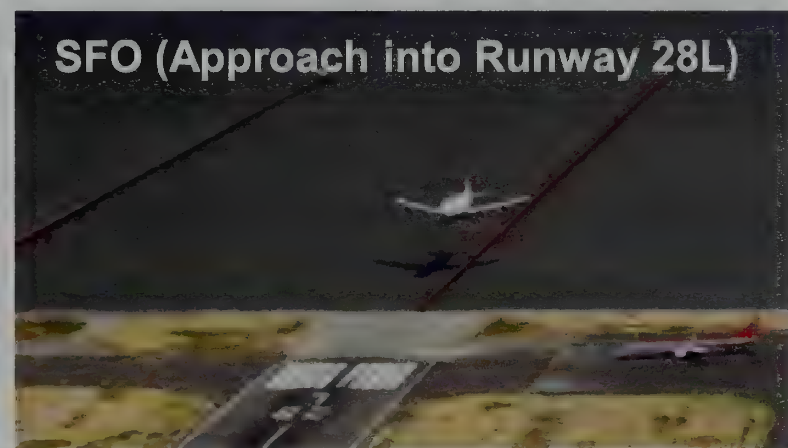
- FAA Office of Inspector General audit completed in 2009 identified 11 large airports facing significant challenges to improving RSAs, which included SFO.

  - The RSAs for SFO's four runways do not meet current FAA design standards defined in FAA Advisory Circular 150/5300-13, *Airport Design*.

What is a Runway Safety Area?

- **Runway Safety Areas** (RSAs) are graded, clear areas around a runway, free of objects and structures that are intended *"to provide a measure of safety in the event of an aircraft's excursion from the runway by significantly reducing the extent of personal injury and aircraft damage during overruns, undershoots and veer-offs."* (FAA Order 5200.8)





Overview of Project Area

SFO RSA Working Group and Alternatives Considered

✈ SFO RSA Working Group:

- *Members:* FAA tower, regional, and local district office staff; SFO divisions; airlines and chief pilots.
- Conducted according to FAA Order 5200.8, *Runway Safety Area Program*, which describes the basic concept alternatives that airport sponsors need to consider.
  - Wide range of alternatives identified and analyzed in order to meet Public Law 109-115.
  - Alternatives considered include filling SF Bay or relocation of U.S.101. to improve existing RSAs.
- Working Group considered operational impacts, environmental, and practicability of meeting deadline.
  - Alternatives with SF Bay fill or relocation of U.S. 101 determined to be impracticable.

Overview of Project Area – Runways 10-28 Pair

Proposed Project: Runways 28R and 28L (east ends)

Proposed project components include:

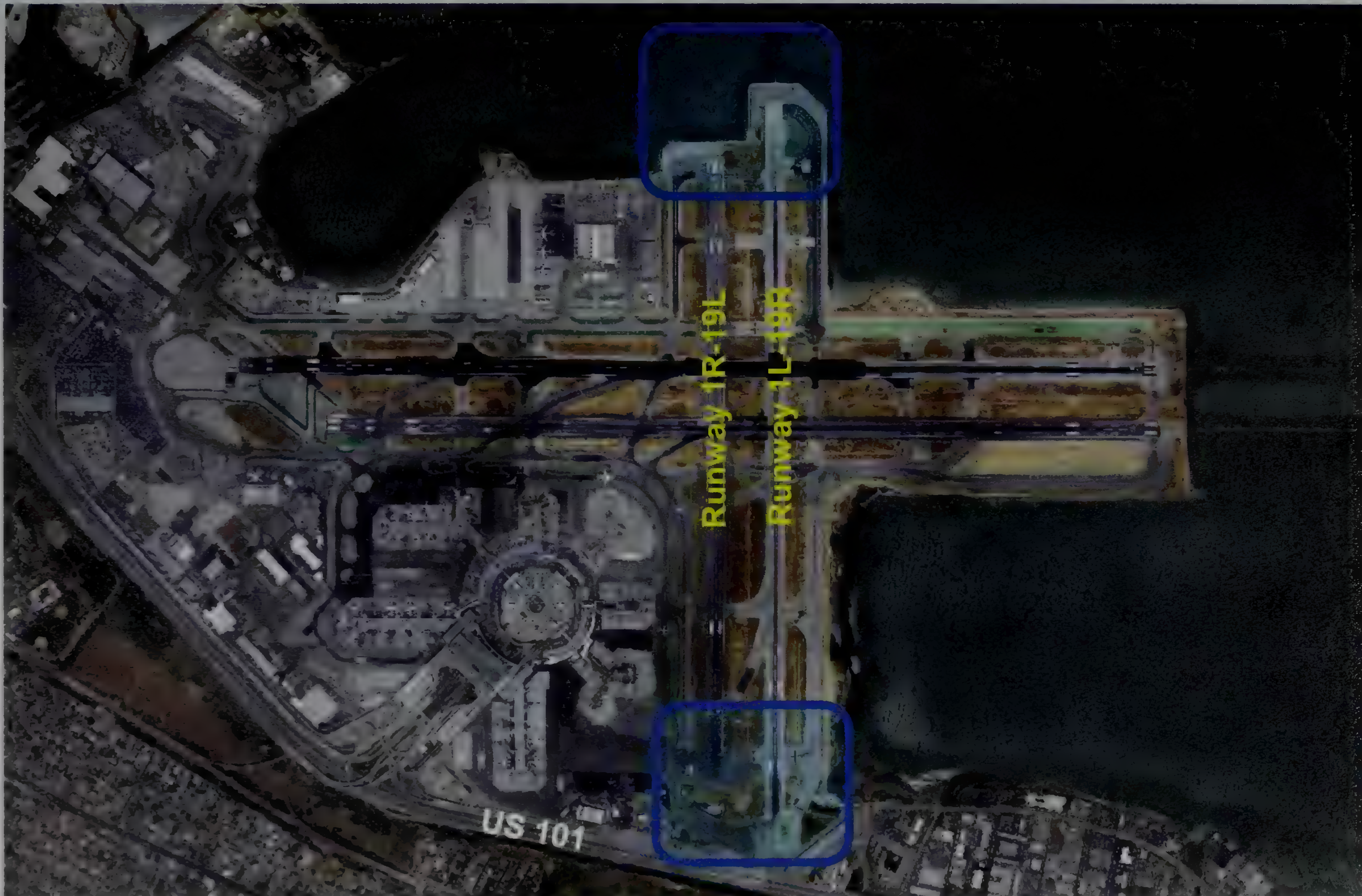
- Displace arrival threshold by 300 ft to make space for 600 ft long arrivals RSA.
- Relocate Station Nos. 5 and 10 (trestle with side bars by spaced at 300 ft. increments).
- Relocate associated navigational aids on airfield.
- Repaint runway end markers.

Proposed Project: Runways 10R and 10L (west ends)

Proposed project components include:

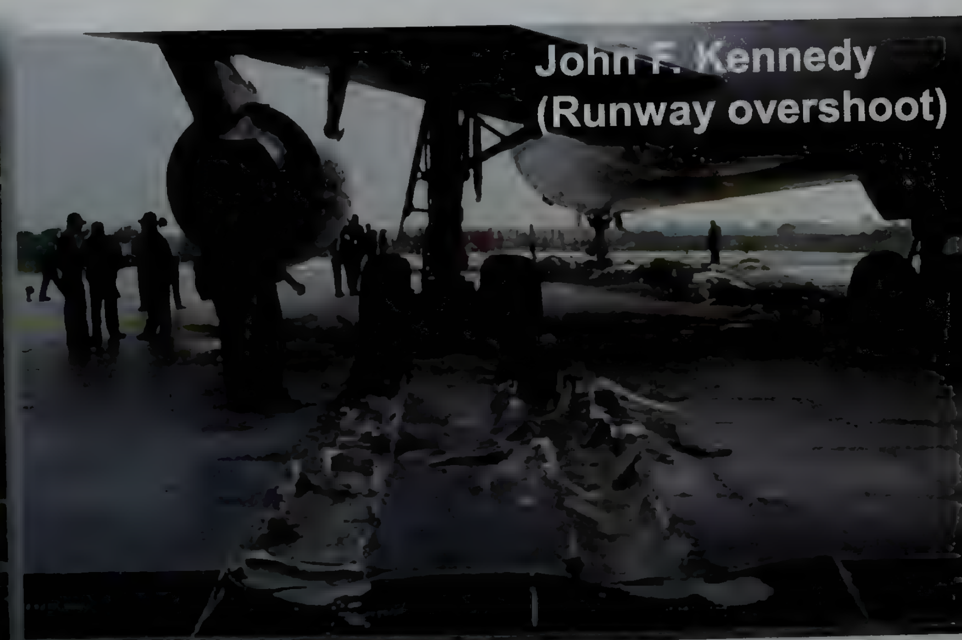
- To accommodate loss of 675 ft of runway length on Runway 28L and to have distance of </= 499 ft between Runways 10L and 10R, relocate runway threshold by 771 feet west.
- Relocate associated navigational aids on airfield.
- Realign taxiways to relocated Runway 10R threshold.
- Repaint runway end markers.

Overview of Project Area – Runways 1-19 Pair

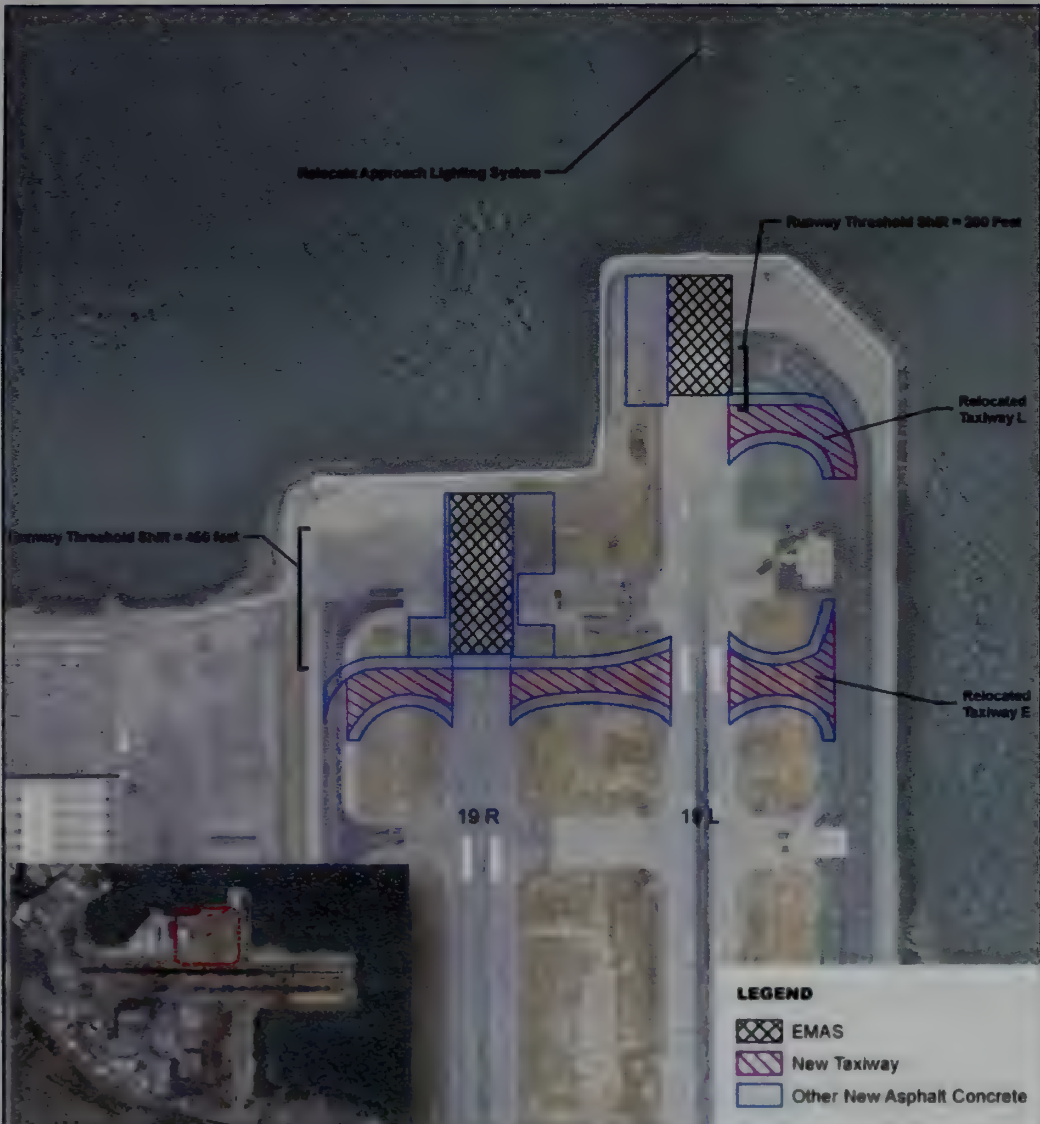


What is EMAS?

- Engineered Material Arresting System (EMAS) is a bed of lightweight, crushable concrete material installed on runway ends designed to safely decelerate aircraft that overrun or overshoot the runway.
- EMAS allows space constrained airports to comply with FAA design standards. EMAS bed length depends on weight of critical design aircraft.
- Currently installed at 51 runway ends at 35 U.S. airports, including Boston, Burbank, San Diego, John F. Kennedy, and Chicago O'Hare.



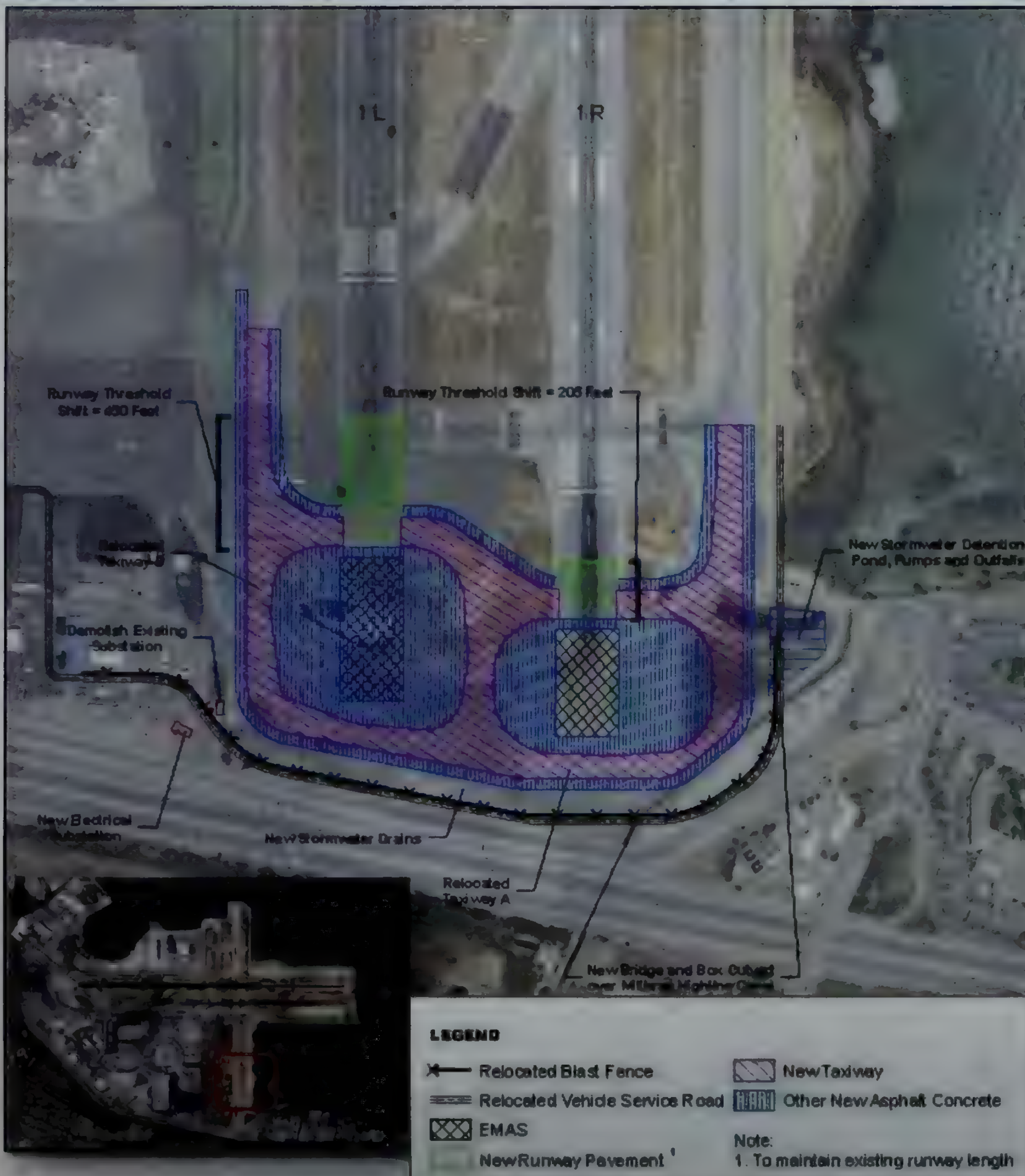
Proposed Project: Runways 19R and 19L (north ends)



Proposed project components include:

- Install nonstandard EMAS on Runways 19L & 19R.
- Relocate runway threshold by 200-450 ft.
- Realign taxiways.
- Demolish existing runway ends and taxiways.
- Relocate associated navigational aids on airfield.
- Repaint runway end markers.
- Relocate a light station/trestle with side bars by existing increment of 200 ft.

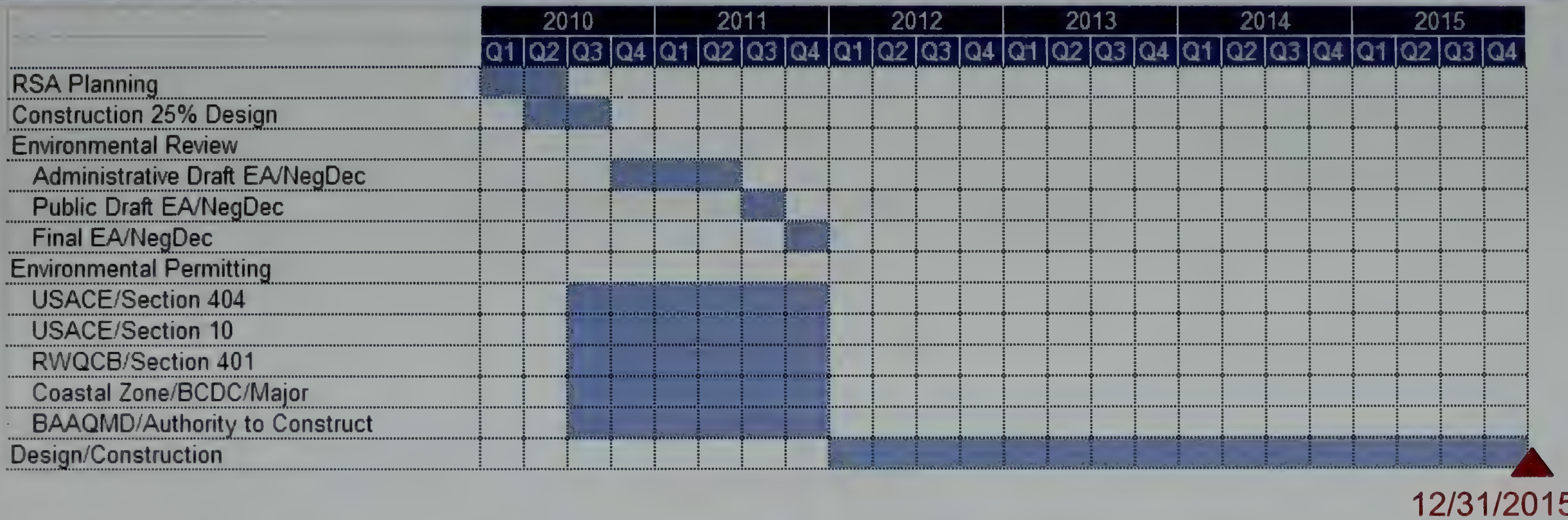
Proposed Project: Runways 1R and 1L (south ends)



Proposed project components include:

- To accommodate loss of runway length on north ends, relocate runway threshold by approximate same length to maintain effective runway length.
- Install nonstandard EMAS on ends of Runways 1L and 1R.
- Realign Taxiways A and A1 to maintain existing operations.
- Fill open surface water detention basins; replace with underground water drainage pipes, new stormwater detention basin, pump station, and outfall pipes.
- Repaint runway end markers.
- Relocate electrical substation outside of taxiway object free area.
- Realign airport security fence and vehicle service road.

RSA Program Schedule



- SFO is working closely with lead agencies (FAA and SF Planning Department) to meet federal deadline.
- SFO anticipates expedited 12 month process for NEPA and CEQA environmental review.
- Construction to start after environmental review, permitting, and design in Quarter 1 of 2012.

Questions & Answers

Thank you!

Q&A Session
and
Solicitation of Comments

Early Notification Comment Letter

CITY OF SAN BRUNO
COMMUNITY DEVELOPMENT DEPARTMENT

November 29, 2010

RECEIVED
DEC -3 2010
Planning and Environmental Affairs

Irene Nishimura
San Francisco Planning Department
1650 Mission Street. Suite 400
San Francisco, CA 94103-2479

RE: Runway Safety Area Program, San Francisco International Airport

Dear Ms. Nishimura:

Thank you for sending me the Notification of Project Receiving Environmental Review related to the Runway Safety Area Program at SFO. I was also able to meet with Audrey Park of the San Francisco International Airport to review the project.

We understand the improvements are to be constructed entirely with in the airport property and will not change the existing traffic patterns. With that in mind, the City wants to ensure that the proposed improvements will not change the imaginary surface as established in FAA Part 77 (which would impact allowed building height). In addition, please confirm the improvements will not change the existing noise contours. The City recently adopted a General Plan and we are currently working on a Transit Corridor Specific Plan. We want to ensure that the proposed runway improvements will not impact the City's ability to build out the vision contained within these plans.

Thank you for the opportunity to comment. If you would like to discuss further, I can be reached at (650) 616-7039 or aaknin@sanbruno.ca.gov.

Sincerely,

Aaron Aknin, AICP
Community Development Director

cc: Audrey Pak, San Francisco International Airport

Appendix F2
Draft EA Public Involvement and Agency Review Documentation

Notice of Availability

U.S. Department of Transportation
Federal Aviation Administration

City and County of San Francisco
San Francisco International Airport

Draft Environmental Assessment
Runway Safety Area (RSA) Program

NOTICE OF AVAILABLITY OF DRAFT ENVIRONMENTAL ASSESSMENT, PUBLIC WORKSHOP AND PUBLIC HEARING

Pursuant to Title 49, United States Code, § 47106(c)(1)(A), notice is hereby given that the City and County of San Francisco, California proposes to implement its Runway Safety Area (RSA) Program for San Francisco International Airport (SFO), San Mateo County, California. The purpose of the SFO RSA Program is to enhance the level of safety provided by RSAs at the Airport to comply with standards included in Federal Aviation Administration (FAA) Advisory Circular 150/5300-13, Airport Design, as required by *The Transportation, Treasury, Housing and Urban Development, the Judiciary, The District of Columbia, and Independent Agencies Appropriations Act, 2006* (Public Law [P.L.] 109-115), November 30, 2005. P.L. 109-115 requires completion of RSA improvements by airport sponsors that hold a certificate under Title 14, Code of Federal Regulations (CFR), Part 139, to meet Federal Aviation Administration (FAA) design standards by December 31, 2015.

The proposed improvements involve a combination of runway shifts and other improvements, and are located in four geographic locations (at the two ends of each pair of parallel runways). The Proposed Action includes shifting of Runways 1L-19R and 1R-19L to the southwest and installation of an Engineered Materials Arresting System (EMAS), and shifting of Runway 10R-28L. The Proposed Action also includes a number of related components such as demolition and relocation of an existing electrical substation building, new underground drainage installations and pump station, relocation of runway and taxiway lights and signage, installation of runway status lights, relocation of an on-airport vehicle service road adjacent to San Francisco Bay, and modifications to existing navigation aids.

The Draft EA evaluates the potential environmental effects of the Proposed Action described above and has been prepared pursuant to the requirements of Section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA), and Section 509(b)(5) of the *Airport and Airway Improvement Act of 1982*, as amended. The FAA is the lead federal agency to ensure compliance with NEPA for airport development actions. The EA has also been prepared in accordance with FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*; and FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*. Pursuant to the federal Endangered Species Act, Clean Water Act, Clean Air Act, Coastal Zone Management Act, National Historic Preservation Act, and Executive Order 11988 on Floodplains and Executive Order 1990 on Wetlands, the Draft EA includes an analysis of prudent or feasible alternatives analysis, potential impacts, and mitigation measures, as appropriate. The sponsor's Proposed Action may affect, but is not likely to adversely affect the California Clapper rail and the Salt Marsh Harvest Mouse, both federally listed endangered species.

Beginning June 24, 2011, the Draft EA will be available for public review at http://www.sforsaprogram.org/index.html or at the following locations during normal business hours through July 29, 2011:

- Federal Aviation Administration, Western-Pacific Region, Office of the Airports Division,
- 15000 Aviation Boulevard, Hawthorne, CA 90261;
- Federal Aviation Administration, San Francisco Airports District Office,
- 831 Mitten Road, Room 210, Burlingame, CA 94010;
- San Francisco International Airport, Bureau of Planning and Environmental Affairs,
- 710 N. McDonnell Road, 3rd Floor, San Francisco, CA 94128;
- South San Francisco Main Library, 840 W. Orange Avenue, South San Francisco, CA 94080;
- San Bruno Library, 701 Angus Avenue West, San Bruno, CA 94066;
- Millbrae Library, 1 Library Avenue, Millbrae, CA 94030;
- Foster City Library, 1000 East Hillsdale Boulevard, Foster City, CA 94404;
- Burlingame Public Library, 480 Primrose Road, Burlingame, CA 94010;
- San Mateo Main Library, 55 West 3rd Avenue, San Mateo, CA 94402;
- Serramonte Main Library, 40 Wembley Drive, Daly City, CA 94015; and
- San Francisco Main Library, 100 Larkin Street, San Francisco, CA 94102.

A Public Workshop on the Draft EA will be held on Thursday, July 28, 2011 at 6:30 p.m. to 7:30 p.m. Pacific Daylight Time, followed by a Public Hearing at 7:30 p.m. to 9 p.m. Pacific Daylight Time in the Chetcuti Room, City of Millbrae, 450 Poplar Avenue, Millbrae, California 94030. Oral and written comments will be accepted at the Public Hearing.

Comments must be received by 5:00 p.m. Pacific Daylight Time on Friday, July 29, 2011. Please ensure adequate time for mailing. Comments received on the Draft EA and the responses to those comments will be disclosed in the Final EA.

Written comments on the adequacy of the information disclosed in the Draft EA may be submitted by mail or facsimile to:

Ms. Audrey Park
San Francisco International Airport
Bureau of Planning and Environmental Affairs
P.O. Box 8097
San Francisco, CA 94128
Fax: (650) 821-5383

Those interested in attending the Public Workshop and/or Hearing who have special communication or accommodation needs are encouraged to contact Audrey Park at least three (3) days prior to the Workshop and Public Hearing. Every reasonable effort to accommodate special needs will be made.

Proofs of Publication

Liquor industry's sales on the rise

Alcohol from page D1

the craft spirits industry is where craft beer was 20 years ago."

A nice bottle of whiskey or wine is a fairly inexpensive luxury item.

"It's not a trip to Hawaii," Winters said. "But if you open a bottle of good rum, it's like taking a trip to the tropics."

But David Ozgo, chief economist with the trade group Distilled Spirits Council of the United States, warned that analysts may be getting ahead of themselves. He disputes Sageworks' numbers, saying spirit sales were up only 2.3 percent in 2010 from the previous year, when revenue was flat.

'Recession resilient'

"We're recession resilient, but not recession proof," he said, adding that during good times, 2000 to 2007, the spirits industry saw sales increases of 6.5 percent per year. "The industry is starting to come back, but the consumer is still concerned about his job and finances."

Christopher T. Fong / The Chronicle

"Globally, the craft spirits industry is where craft beer was 20 years ago."

Lance Winters, distiller, St. George Spirits, Alameda

Mintel International Group Ltd., a marketing company, predicts that domestic beer sales will grow 19 percent, to $73 billion, from 2010 to 2015. Craft beers have done particularly well. In the first half of 2010, volume in the category grew 9 percent, compared with a decline of 2.7 percent in overall beer volume, based on Brewer Association numbers, according to Mintel.

Imported beer took the hardest hit during the recession, forfeiting many of its devotees to the craft market, reported Mintel.

From 2010 to 2015, the marketing firm forecasts, wine sales will grow by 28 percent to $39 billion.

"In the spectrum of indulgences, it's easier for consumers to buy a nice bottle of wine for the weekend than a cruise," McPeak said.

Tequila's popularity

Eric Rubin, whose San Francisco Tres Agaves Tequila company opened in 2010, said his business has steadily grown. He credits part of its success to Tequila's popularity, a category that has continued to flourish over the past 11 years. Rubin said what particularly drove his business was adding cocktail fixings, including margarita mix and agave syrup, to his line of Tequilas.

"If anything, we've seen the recession play a role on drinking patterns," he said. "More people are drinking at home, setting up their own bars and making their own drinks."

But Rubin adds that consumers, especially where alcohol is concerned, tend to be creatures of habit.

100% agave

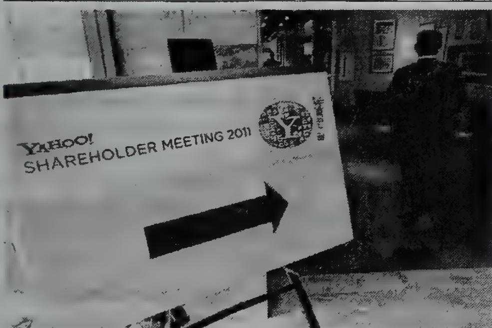
"If someone drinks 100 percent agave Tequila, they're not going to change to a mixto," Tequila made with a minimum of 51 percent agave and other fermented sugars, he said. "They may buy a brand that's less expensive, but they're going to continue drinking 100 percent agave."

For Rubin, whose Tequilas are pure agave, that means happy days.

But Ozgo isn't quite ready to say "so long sad times" — at least not until revenue returns to where it was in the early 2000s.

But for now, he said, "things are looking better."

E-mail Stacy Finz at sfinz@sfchronicle.com.



Tony Avelar / Bloomberg News

At the Yahoo shareholder meeting, an investor who owns stock and advises funds called CEO Carol Bartz a "lame duck" who should be bought out.

Yahoo's embattled CEO tries to tame investors

Yahoo from page D1

some at the meeting, have expressed frustration with Yahoo's growth prospects and the way it has handled Asian assets that analysts say may make up more than half its value. Under Bartz, who is more than halfway through her contract, Yahoo has slashed costs with job cuts and a partnership with Microsoft Corp. Still, Yahoo's U.S. search market share has stalled at about 16 percent since December, according to ComScore Inc.

"Some of the longer-term shareholders have been very patient," Ryan Jacob, portfolio manager of the Jacob Internet Fund in Los Angeles, said in a phone interview before the meeting. "That patience is slowly coming to an end."

One unhappy investor ended the Thursday meeting with a five-minute condemnation of Bartz and the entire board of directors.

The investor identified himself as someone who personally owns some Yahoo stock and advises funds that own several million of the company's shares. His identity couldn't be verified because Yahoo banned reporters from the meeting, telling the media to listen to a webcast of the event instead.

"Some of the longer-term shareholders have been very patient. That patience is slowly coming to an end."

Ryan Jacob, portfolio manager of the Jacob Internet Fund

During his unflattering critique, the investor described Bartz as a "lame duck" who should be immediately bought out of a four-year contract that expires in January 2013. He also called upon Yahoo's board to consider a variety of dramatic steps, including breaking up or selling the company to lift the stock. Yahoo's shares have been lagging the rest of the market for so long that Bartz still hasn't hit any of the price targets set for her when she was hired nearly 2½ years ago.

"It's time for a sense of urgency," the investor said.

Bartz thanked him for his opinion and then added, "That was certainly a downer." No other shareholder lambasted Bartz during the 75-minute meeting.

Yahoo fell 15 cents to $15.08 on the Nasdaq Stock Market. Before Thursday, shares of the Sunnyvale company had gained 2.7 percent since last year's meeting, compared with a 20 percent jump in the technology-laden Nasdaq composite index. The Nasdaq composite's gain has outpaced Yahoo's by almost three times since Bartz was named CEO in January 2009.

"The honeymoon's long over," said Colin Gillis, an analyst with BGC Partners LP in New York. He rates the stock a hold and doesn't own it. "While the company is turning around, the competition continues to grow in the space."

Dana Lengkeek, a spokeswoman for Yahoo, declined to comment.

The Associated Press contributed to this report.

LEGAL NOTICES legalnotice.org/pl/sfgate

PUBLIC NOTICES

U.S. Department of Transportation
Federal Aviation Administration

City and County of San Francisco
San Francisco International Airport

Draft Environmental Assessment (EA)
Runway Safety Area (RSA) Program

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San Francisco International Airport
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P.O. Box 8097
San Francisco, CA 94128
Fax: (650) 821 5383

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NOTICE OF AVAILABILITY
FINDING OF NO SIGNIFICANT IMPACT for
U. S. DEPARTMENT OF VETERANS AFFAIRS
VETERINARY MEDICAL UNIT REPLACEMENT AND EXPANSION PROJECT
SAN FRANCISCO VA MEDICAL CENTER (SFVAMC)

The U.S. Department of Veterans Affairs (VA) assessed the potential impacts of the various efforts of construction and operation associated with the proposed Veterinary Medical Unit Replacement and Expansion Project at the San Francisco VA Medical Center (SFVAMC). An Environmental Assessment (EA) was prepared in accordance with the regulations set forth by the Council on Environmental Quality implementing the provisions of the National Environmental Policy Act (NEPA) (CEQ Regulations, Title 40 CFR 1500-1508), Executive Order 11514 as amended by Executive Order 11991, and VA Regulations - Environmental Effects of VA Actions (Title 38 CFR Part 26). The EA is incorporated by reference into the Finding of No Significant Impact (FONSI).

The EA was circulated for public period from January 31 to April 4, 2011. A Notice of Availability for the EA was published in the San Francisco Chronicle on February 1, 2011. Hard copies of the EA were distributed on January 31, 2011. The VA received five (5) comment letters during the public review period of the EA. There were issues raised in each of the comment letters and related to a range of topics. Therefore, responses have been prepared to address the specific comments related to each topic. The responses provided clarification and provided specific references to the EA to address each comment. The EA together with these responses constitute the Final EA for the project.

Hard copies of the FONSI and Final EA are available for review between 8:00 a.m. and 4:00 p.m. Monday thru Friday at the SFVAMC Bldg. [illegible] Engineering Office, Room 1. The FONSI and EA can also be accessed online at http://www.sanfrancisco.va.gov/visitors/construction.asp

For further information and/or a copy of the FONSI or Final EA, please contact:

Jon Bassignani, Project Manager
San Francisco VA Medical Center
4150 Clement Street
San Francisco, CA 94121
Phone: (415) 221-4810 Ext 2840
Jonathan.Bassignani@va.gov

GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT
NOTICE INVITING SEALED PROPOSALS

The Golden Gate Bridge, Highway and Transportation District (District) seeks proposals for Request for Proposals (RFP) No. 2012-D-1, Customer Communication Services Platform Utilizing Interactive Voice Technology. Interested Proposers must submit sealed proposals to the Office of the Secretary of the District on Tuesday, July 12, 2011, by 4:30 p.m., PST.

A Pre-Proposal Conference will be held in the Conference Room at the Golden Gate Transit Administration Offices, District Division Administration Building, 1011 Andersen Drive, San Rafael, CA, on Monday, June 27, 2011, at 2:00 p.m., Pacific Standard Time. Firms may participate by telephone upon request at least three days in advance of the Pre-Proposal Conference.

Request for modifications or clarifications of any requirement must be submitted in writing on Tuesday, July 5, 2011, by 4:30 p.m., PST.

The RFP Documents are available for download on the District's web site. To download the RFP Documents, go to the District's web site home page at http://www.goldengate.org, click on Contract Opportunities, scroll down to District Division and look for RFP No. 2012-D-1.

To inspect and obtain the RFP Documents, please contact the Office of the Secretary of the District, Administration Building, Golden Gate Bridge Toll Plaza, San Francisco, CA, by telephone at (415) 923-2223, by facsimile at (415) 923-2013, or by e-mail at districtsecretary@goldengate.org

/s/ Janet S. Tarantino
Secretary of the District
Dated: June 24, 2011
6/24/11

PUBLIC NOTICES (NON-GOVERNMENT)

Legal Notice
Request Type: New Build

Notification is given that JPMorgan Chase Bank, N.A., 1111 Polaris Parkway, Columbus, Ohio 43271 has filed an application with the Comptroller of the Currency on or about 6/24/2011, as specified in 12 CFR 5 for permission to establish a domestic branch at 2420 [illegible], San Francisco County, San Francisco, CA [illegible]. Any person wishing to comment on this application may file comments in writing with the Licensing Manager, Large Banks Licensing Operations, Office of the Comptroller of the Currency, 250 E Street, SW, Mail Stop 7-13, Washington, DC [illegible] within 30 days of the date of this publication.

FICTITIOUS BUSINESS NAMES

FICTITIOUS BUSINESS NAME STATEMENT
FILE NO. A-0335[illegible]-00

The following person is doing business as THE CRONIN LAW GROUP, 314 Montgomery Street, Second Floor, San Francisco County, San Francisco, CA 94104. Full name of registrant: Timothy C. Cronin, 20 Manzanita [illegible], Atherton, CA 94027. This business is conducted by an individual.

The registrant commenced to transact business under the above-listed fictitious business name on July 01, 2009.

This statement was filed with the County Clerk of San Francisco on May 23, 2011.

Publication dates
June 03, 10, 17, 24, 2011

San Jose Mercury News

750 RIDDER PARK DRIVE
SAN JOSE, CALIFORNIA 95190
408-920-5332

PROOF OF PUBLICATION

IN THE
CITY OF SAN JOSE
STATE OF CALIFORNIA
COUNTY OF SANTA CLARA

URS CORP
2870 GATEWAY OAKS DR,300
SACRAMENTO CA 95833-0000

FILE NO. SFO RSA EA NO/

In the matter of

The San Jose Mercury News

The undersigned, being first duly sworn, deposes and says: That at all times hereinafter mentioned affiant was and still is a citizen of the United States, over the age of eighteen years, and not a party to or interested in the above entitled proceedings; and was at and during all said times and still is the principal clerk of the printer and publisher of the San Jose Mercury News, a newspaper of general circulation printed and published daily in the city of San Jose in said County of Santa Clara, State of California as determined by the court's decree dated June 27, 1952, case numbers 84096 and 84097, and that said San Jose Mercury News is and was at all times herein mentioned a newspaper of general circulation as that term is defined by Sections 6000 and following, of the Government Code of the State of California and, as provided by said sections, is published for the dissemination of local or telegraphic news and intelligence of a general character, having a bona fide subscription list of paying subscribers, and is not devoted to the interests or published for the entertainment or instruction of a particular class, professional, trade, calling, race or denomination, or for the entertainment and instruction of any number of such classes, professionals, trades, callings, races or denominations; that at all times said newspaper has been established, printed and published in the said city of San Jose in said County and State at regular intervals for more than one year preceding the first publication of the notice herein mentioned. Said decree has not been revoked, vacated or set aside.

I declare that the notice, of which the annexed is a true printed copy, has been published in each regular or entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

6/24/2011

Dated at San Jose, California
06/24/11

I declare under penalty of perjury that the foregoing is true and correct.

Signed ____________________

Principal clerk of the printer and publisher of the San Jose Mercury News.

Legal No. **0004053931**

U.S. Department of Transportation
Federal Aviation Administration

City and County of San Francisco
San Francisco International Airport

Draft Environmental Assessment (EA)
Runway Safety Area (RSA) Program

NOTICE OF AVAILABLITY OF DRAFT ENVIRONMENTAL ASSESSMENT, PUBLIC WORKSHOP AND PUBLIC HEARING

Pursuant to Title 49, United States Code, § 47106(c)(1)(A), notice is hereby given that the City and County of San Francisco, California proposes to implement its Runway Safety Area (RSA) Program for San Francisco International Airport (SFO), San Mateo County, California. The purpose of the SFO RSA Program is to enhance the level of safety provided by RSAs at the Airport to comply with standards included in Federal Aviation Administration (FAA) Advisory Circular 150/5300-13, Airport Design, as required by The Transportation, Treasury, Housing and Urban Development, the Judiciary, The District of Columbia, and Independent Agencies Appropriations Act, 2006 (Public Law [P.L.] 109-115), November 30, 2005. P.L. 109-115 requires completion of RSA improvements by airport sponsors that hold a certificate under Title 14, Code of Federal Regulations (CFR), Part 139, to meet Federal Aviation Administration (FAA) design standards by December 31, 2015.

The proposed improvements involve a combination of runway shifts and other improvements, and are located in four geographic locations (at the two ends of each pair of parallel runways). The Proposed Action includes shifting of Runways 1L-19R and 1R-19L to the southwest and installation of an Engineered Materials Arresting System (EMAS), and shifting of Runway 10R-28L. The Proposed Action also includes a number of related components such as demolition and relocation of an existing electrical substation building, new underground drainage installations and pump station, relocation of runway and taxiway lights and signage, installation of runway status lights, relocation of an on-airport vehicle service road adjacent to San Francisco Bay, and modifications to existing navigation aids.

The Draft EA evaluates the potential environmental effects of the Proposed Action described above and has been prepared pursuant to the requirements of Section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA), and Section 509(b)(5) of the Airport and Airway Improvement Act of 1982, as amended. The FAA is the lead federal agency to ensure compliance with NEPA for airport development actions. The EA has also been prepared in accordance with FAA Order 1050.1E, Environmental Impacts: Policies and Procedures; and FAA Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions. Pursuant to the federal Endangered Species Act, Clean Water Act, Clean Air Act, Coastal Zone Management Act, National Historic Preservation Act, and Executive Order 11988 on Floodplains and Executive Order 1990 on Wetlands, the Draft EA includes an analysis of prudent or feasible alternatives analysis, potential impacts, and mitigation measures, as appropriate. The sponsor's Proposed Action may affect, but is not likely to adversely affect the California Clapper rail and the Salt Marsh Harvest Mouse, both federally listed endangered species.

Beginning June 24, 2011, the Draft EA will be available for public review at http://www.sforsaprogram.org/index.html or at the following locations during normal business hours through July 29, 2011:

- Federal Aviation Administration, Western-Pacific Region, Office of the Airports Division, 15000 Aviation Boulevard, Hawthorne, CA 90261;
- Federal Aviation Administration, San Francisco Airports District Office, 831 Mitten Road, Room 210, Burlingame, CA 94010;
- San Francisco International Airport, Bureau of Planning and Environmental Affairs, 710 N. McDonnell Road, 3rd Floor, San Francisco, CA 94128;
- South San Francisco Main Library, 840 W. Orange Avenue, South San Francisco, CA 94080;
- San Bruno Library, 701 Angus Avenue West, San Bruno, CA 94066;
- Millbrae Library, 1 Library Avenue, Millbrae, CA 94030;
- Foster City Library, 1000 East Hillsdale Boulevard, Foster City, CA 94404;
- Burlingame Public Library, 480 Primrose Road, Burlingame, CA 94010;
- San Mateo Main Library, 55 West 3rd Avenue, San Mateo, CA 94402;
- Serramonte Main Library, 40 Wembley Drive, Daly City, CA 94015; and
- San Francisco Main Library, 100 Larkin Street, San Francisco, CA 94102.

A Public Workshop on the Draft EA will be held on Thursday, July 28, 2011 at 6:30 p.m. to 7:30 p.m. Pacific Daylight Time, followed by a Public Hearing at 7:30 p.m. to 9 p.m. Pacific Daylight Time in the Chetcuti Room, City of Millbrae, 450 Poplar Ave-

nue, Millbrae, California 94030. Oral and written comments will be accepted at the Public Hearing.

Comments must be received by 5:00 p.m. Pacific Daylight Time on Friday, July 29, 2011. Please ensure adequate time for mailing. Comments received on the Draft EA and the responses to those comments will be disclosed in the Final EA.

Written comments on the adequacy of the information disclosed in the Draft EA may be submitted by mail or facsimile to:

Ms. Audrey Park
San Francisco International Airport
Bureau of Planning and Environmental Affairs
P.O. Box 8097
San Francisco, CA 94128
Fax: (650) 821-5383

Those interested in attending the Public Workshop and/or Hearing who have special communication or accommodation needs are encouraged to contact Audrey Park at least three (3) days prior to the Workshop and Public Hearing. Every reasonable effort to accommodate special needs will be made.

SJMN 4053931 **June 24, 2011**

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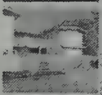

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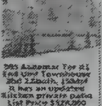

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The Mercury News

SUPERIOR COURT OF CALIFORNIA COUNTY OF SANTA CLARA PETITION OF NEELA KULKARNI DR. PRINCE SHAH FOR CHANGE OF NAME ORDER TO SHOW CAUSE FOR CHANGE OF NAME

NOTICE OF HEARING

SUPERIOR COURT OF CALIFORNIA COUNTY OF SANTA CLARA PETITION OF ... FOR CHANGE OF NAME ORDER TO SHOW CAUSE FOR CHANGE OF NAME

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SUPERIOR COURT OF CALIFORNIA COUNTY OF SANTA CLARA PETITION OF ... FOR CHANGE OF NAME ORDER TO SHOW CAUSE FOR CHANGE OF NAME

NOTICE OF HEARING

Superior Court of California, County of Santa Clara 191 N. First Street, San Jose, CA 95113

Downtown: Superior Court

NOTICE OF PETITION TO ADMINISTER ESTATE OF Michael Van Slater Snyder

U.S. Department of Transportation Federal Aviation Administration

City and County of San Francisco San Francisco International Airport

Draft Environmental Assessment (EA) Runway Safety Area (RSA) Program

NOTICE OF AVAILABILITY OF DRAFT ENVIRONMENTAL ASSESSMENT, PUBLIC WORKSHOP AND PUBLIC HEARING

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PROOF OF PUBLICATION

FILE NO. SFO RSA EA NO/

In the matter of

San Mateo County Times

The undersigned deposes that he/she is the Public Notice Advertising Clerk of the SAN MATEO COUNTY TIMES, a newspaper of general circulation as defined by Government Code Section 6000, adjudicated as such by the Superior Court of the State of California, County of San Mateo (Order Nos. 55795 on September 21, 1951), which is published and circulated in said county and state daily (Sunday excepted).

The PUBLIC NOTICE

was published in every issue of the SAN MATEO COUNTY TIMES on the following date(s):

6/24/2011

I certify (or declare) under the penalty of perjury that the foregoing is true and correct.

Public Notice Advertising Clerk

Legal No. **0004053945**

U.S. Department of Transportation
Federal Aviation Administration

City and County of San Francisco
San Francisco International Airport

Draft Environmental Assessment (EA)
Runway Safety Area (RSA) Program

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SMCT 4053945 **June 24, 2011**

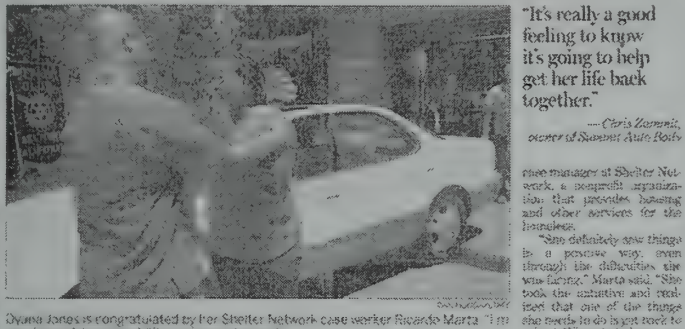
Lexus

Continued from Page 1

thought of the idea of donating a car to a family in need. One of his customers wrecked her Lexus in an accident and figured it was too expensive to repair, Zammit said. So he asked her if she wanted to donate the vehicle. The customer agreed.

The Lexus underwent about $5,000 of renovation, with his shop and other companies in the auto industry chipping in parts and labor, Zammit said. The work included repairing the front bumper, headlights and brakes. Zammit plans to keep the car-donation effort going. "The next car we want to donate is for a war veteran," he said.

As for giving Jones the Lexus, Zammit said, "It's really a good feeling to know it's going to help get her life back together."



Dyana Jones is congratulated by her Shelter Network case worker Ricardo Marta. "I'm very happy," Jones said. "I'm just overwhelmed."

Jones, 40, has endured more than her fair share of struggles since the father of her children died of heart failure in 1991. "It's been very hard," she said, "but I've had a lot of support from my sister, brother-in-law and Ricardo."

"It's really a good feeling to know it's going to help get her life back together."

— Chris Zammit, owner of Summit Auto Body

Ricardo Marta was her case manager at Shelter Network, a nonprofit organization that provides housing and other services for the homeless.

"She definitely saw things in a positive way, even through the difficulties she was facing," Marta said. "She took the initiative and realized that one of the things she needs to do is get back to school. What she's doing provides motivation for her kids as well."

Contact Neil Gonzales at 650-348-4338.

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U.S. Department of Transportation Federal Aviation Administration

City and County of San Francisco San Francisco International Airport

Draft Environmental Assessment (EA) Runway Safety Area (RSA) Program

NOTICE OF AVAILABILITY OF DRAFT ENVIRONMENTAL ASSESSMENT, PUBLIC WORKSHOP AND PUBLIC HEARING

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Burlingame Elementary School District

NOTICE OF PUBLIC HEARING

Please take notice that on Thursday, July 28, 2011 at 7:30 a.m., in the Burlingame Elementary School District Board Room, 1825 Trousdale Drive, Burlingame, California 94010, the District's Board of Trustees will conduct a public hearing and consider adopting a resolution proposing to establish a qualified special tax to be submitted for voter approval on November 8, 2011, in an amount not to exceed $95 per year (estimated annual collection of $750,000) for eight years for a variety of educational programs, including the maintenance of programs in math, science, reading, writing, art, music, as well as for books and classroom materials and the retention of qualified teachers, and guaranteeing an exemption for certain seniors and disabled persons.

SMCT#4654431

June 24, July 1, 8, 15, 22, 2011

Public Hearing Transcript

SAN FRANCISCO INTERNATIONAL AIRPORT

RUNWAY SAFETY AREA PROGRAM

DRAFT ENVIRONMENTAL ASSESSMENT

HEARING

at

Chetcuti Room, City of Millbrae

450 Poplar Avenue

Millbrae, California

REPORTED BY:

MICHAEL CUNDY, CSR 12271

JAN BROWN & ASSOCIATES

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(On the record at 7:30 P.M.)

-oOo-

MR. KIM: Good evening, everyone. Welcome to tonight's hearing of the SFO RSA program on the draft EA for the proposed runway safety project at SFO.

The time is 7:30 Pacific daylight time. We have closed the public workshop and will start the formal public hearing on the draft EA for the proposed runway safety project for SFO.

My name is Johnnie Kim. I'm the deputy project manager from SFO Bureau of Planning and Environmental Affairs, and I will be the hearing officer for tonight's public hearing.

The purpose of this formal public hearing is to get public input on adequacy of the information disclosed in the draft EA.

This public hearing is not a forum for debate on the project. If you have any questions, we will be more than happy to take questions and respond to them in the comment section in the final EA.

You may speak tonight or you can submit comments in writing. You can fill out a comment card and submit it in the box out in the lobby.

And also, as described in the form, you can mail

or fax in the form or hand-deliver to the address on the form.

These ways are also detailed on the comment cards.

If you are uncomfortable with speaking in public and/or do not wish to have your comments transcribed by the court reporter but you want to make comments on draft EA, written comments are just as valid or valuable as verbal comments, so please fill out a comment card.

Please be respectful of all speakers tonight, whether you agree or disagree.

We will not be responding to comments tonight. They will be addressed again in writing in the final EA.

Comments received on the draft EA and responses to those comments will be disclosed in the final EA document.

Again, we are seeking comments on the adequacy of the information disclosed in the draft EA and as a reminder, comments must be received by the close of the 30-day public comment period, which is 5:00 P.M. Pacific daylight time on Friday, July 29, 2011.

I am going to go through a couple of the rules of the procedures that we will follow for tonight's hearing.

I will be calling the names of persons that have submitted a request to speak in the order that we received them.

In interest of time and to give everyone a chance

to comment, please limit your comments to three minutes per speaker. If you don't think you can fit all of your comments in the alotted three minutes, you can also submit a comment card with written comments in the collection box at the information table.

When 30 seconds remains, I will hold up a sign, and that's your signal to wrap up your statement.

Please proceed to this podium located at the front of the room when your name is called and speak clearly into the wireless microphone, making sure the microphone is switched on.

Prior to making your comments, please state your name, address, and the organization you are representing, if any, for the record.

Our court reporter will be recording everything tonight for the hearing transcript, so please speak clearly.

Okay. I have not received any requests to speak.

Is there anyone in the audience that would like to submit a verbal comment at this time?

Seeing none, we will keep the public hearing open until 9:00 o'clock.

(A recess was taken from 7:34 P.M. to 9:00 P.M.)

MR. KIM: It is now 9:00 P.M. Pacific daylight

time, and I do not see anyone approaching the speaker's podium.

This formal public hearing on the adequacy of information disclosed in the draft EA is now closed.

Thank you all for coming tonight and participating in our public workshop and public hearing.

Thanks to the team of staff of consultants.

As a final reminder, please submit any additional comments before the close of the comment period.

Good night.

(Off the record at 9:02 P.M.)

I do hereby certify that the foregoing meeting was taken at the time and place therein stated; that the testimony of said parties was reported by me, a shorthand reporter and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

MICHAEL CUNDY, CSR 12271

Public Workshop and Public Hearing Sign-in Sheet

San Francisco International Airport
Runway Safety Area Program
Draft Environmental Assessment

Public Workshop and Public Hearing
Thursday, July 28, 2011
Public Workshop: 6:30 p.m. to 7:30 p.m. PDT
Public Hearing: 7:30 p.m. to 9:00 p.m. PDT

Sign-In Sheet

Name/Organization	Address	Email
CHRISTOPHER WOLF URS CORPORATION	ONE MONTGOMERY ST, #900 SAN FRANCISCO, CA 94104	CHRISTOPHER_WOLF@ URSCORP.COM
Alissa Stillman URS CORPORATION	one Montgomery St #900 San Francisco, CA 94104	Alissa_Stillman@ URSCORP.com
Bill Fehring URS Corporation	7650 West Courtney Campbell Cswy Tampa, FL 33607	bill_fehring@urscorp.com
Paul Dunholter BridgeNet	20201 SW Birch St. Newport Beach CA 92660	phd@airportnetwork.com
Nixon Lam SFO Planning	PO Box 8097 SF, CA 94128	nixon.lam@flysfo.com
JOHN KIM SFO PLANNING	PO BOX 8097 SAN FRANCISCO, CA 94128	john.kim@flysfo.com
MICHAEL LAWRANCE - SFO OPERATIONS	"	michael.lawrance@flysfo.com
BERT GANOUNG - SFO NOISE ABATEMENT	"	bert.ganoung@flysfo.com
AVANT RAMSEY - SFO PLANNING	"	avant.ramsey@flysfo.com
CATHY WIDENER - SFO	"	ACWIDENER@flysfo.com
FARHAD MORTAZAVI	CITY of MILLBRAE	fmortazavi@ci.millbrae.ca.us
COLLEEN LIANG	PORT OF OAKLAND	cliang@portoakland.com
Jim Chiu	SFO	Jim.Chiu@flysfo.com
Mark Fantozzi	SFO	mark.fantozzi@aecom.com
DAVE CARBONE	455 COUNTY CENTER 2nd FLOOR REDWOOD CITY, CA 94063	dcarbone@co.sanmateo.ca.us

San Francisco International Airport
Runway Safety Area Program
Draft Environmental Assessment

Public Workshop and Public Hearing
Thursday, July 28, 2011
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Sign-In Sheet

Name/Organization	Address	Email
Vishal Trivedi - SFO	SFO	vishal.trivedi@flysfo.com
Sean O'Brien	LSA Associates	Sean.O'Brien@LSA-Assoc.com
Ross Dobberteen	" "	Ross.Dobberteen@ " "
DANIEL LEE	SFO	—
Terra Petsuch	SFO	
Tiffany Ip	SFO	—
Shirley Cho	SFO	—
Audrey Park SFO Planning	PO BOX 8097 SF CA 94128	audrey.park@flysfo.com

Comments and Responses

C/CAG

City/County Association of Governments
of San Mateo County

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July 27, 2011

RECEIVED
JUL 28 2011
...g and Environmental Affairs

Ms. Audrey Park
San Francisco International Airport
Bureau of Planning and Environmental Affairs
P.O. Box 8097
San Francisco, CA 94128

Dear Ms. Park:

RE: C/CAG Airport Land Use Committee (ALUC) Staff Comments on the Relevant Content of a *Draft Environmental Assessment (EA) for the Proposed Runway Safety Area (RSA) Program at San Francisco International Airport June 2011*

Thank you for the opportunity to review and comment on the above-referenced document. I found the document well written and very comprehensive. My specific comments address two issues related to implementation the proposed RSA project: (1) aircraft noise contours and (2) airspace protection surfaces. 1-1

Aircraft Noise Contours

The aircraft noise analysis in the Draft EA addresses future aircraft noise exposure in 2015 and 2020 for the No Project Alternative and the Proposed Project Alternative. 1-2

1. How does the aircraft noise analysis for those years relate to the Airport's current effort to update its FAR Part 150 Noise Exposure Maps (NEMs: baseline and five year projection) as required by the FAA? The Airport's most current FAA-accepted NEMs are for 2001 and 2006.

2. Which set of noise contours (the pending NEM update contours or the contours for 2015 and 2020 contained in the Draft EA for the RSA Program) should the Airport Land Use Commission (C/CAG Board of Directors) use in the current update of the comprehensive airport land use compatibility plan (CLUP) for the environs of San Francisco International Airport? 1-3

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3. The aircraft noise contour maps shown in Figures 4.2-5 and 4.2-6 in the Draft EA include very useful detail of the configuration of the 65 dB CNEL contour with the No Action Alternative and the 65 dB CNEL contour with the Proposed Action Alternative. However, the Draft EA does not include similar figures that show the configuration of the 65 dB CNEL No Action Alternative contour and the 65 dB CNEL Proposed Action Alternative contour on the departure end of Runways 28 in Daly City. At this location, it appears that the 65 dB CNEL contour is longer and has a slightly different end shape in 2020 for both the No Action Alternative and the Proposed Action Alternative than the 65 dB CNEL contour for both alternatives in 2015. Inclusion of a detailed graphic of the configuration of the 65 dB CNEL contour in the Daly City/South San Francisco area for both alternatives in both years similar to the analysis shown in Figures 4.2-5 and 4.2-6 would be very useful for current and future land use planning in that area. **1-4**

Airspace Protection Surfaces

The next to last paragraph on p. 5-3 states the following:

> "For the purposes of describing the resultant changes in the location and vertical height of the overlying 14 CFR Part 77, Civil Airport Imaginary Surfaces that would be affected by the proposed extension of Runways 10R and a shift of Runways 1L and 1R, the discussions of those respective height changes are limited to the assessment of the approach surfaces only."

1-5

1 The imaginary surfaces described in 14 CFR Part 77 also include Transitional Surfaces. These 7:1 surfaces are attached to both sides of the Approach Surfaces. Per the text above, the Draft EA does not mention the Transitional Surfaces. How does the lower vertical change in the Approach Surfaces for Runways 10R, 1L, and 1 R, as shown in Figures 5-2, 5-3, and 5-4 affect the size and configuration of the Transitional Surfaces? If there is no change in the configuration of the Transitional Surfaces for the Proposed Action Alternative, the text in the Draft EA should say so. If there is a change in the configuration of the Transitional Surfaces from the Proposed Action Alternative for any runway end, the Draft EA should include descriptive text and a graphic for each one that illustrates the changes.

2 In addition to the imaginary surfaces in 14 CFR Part 77, there are also airspace protection surfaces established in accordance with FAA Order 8260.3B, *U.S. Standards for Terminal Instrument Procedures (TERPS)* that apply to the runway configuration at San Francisco International Airport. The Draft EA is silent on the potential RSA impacts related to these surfaces. How does implementation of the RSA program affect the TERPS surfaces? **1-6**

3 The text in the Draft EA does not indicate if the lower Approach Surfaces in the Proposed Action Alternative create any obstructions (man-made or physical) in the runway approach paths. This is especially important in the 23-foot lower approach path to Runway 10R (over Daly City, South San Francisco, and San Bruno) (see Figure 5-2) and the 22.5 foot lower approach path to Runway 1L (over Millbrae and Burlingame) (see Figure 5-3). This information would be very useful to the airlines, the FAA, and the affected cities. **1-7**

Thank you for the opportunity to review and comment on the relevant content of the *Draft Environmental Assessment (EA) for the Proposed Runway Safety Area (RSA) Program at San Francisco International Airport June 2011*. If you have any questions, please contact me at 650/363-4417 (direct number) or via email at dcarbone@co.sanmateo.ca.us

Sincerely,

David F. Carbone

David F. Carbone,
C/CAG Airport Land Use Committee (ALUC) Staff

cc: Richard Napier, C/CAG Executive Director
Richard Newman, C/CAG Airport Land Use Committee (ALUC) Chairperson
C/CAG Airport Land Use Committee (ALUC) Members
Jim Eggemeyer, Community Development Director, San Mateo County

ALUCstaffcomletSFODraftRSAEA0711.doc

RESPONSE TO COMMENT 1

Response 1-1: Comment regarding the comprehensive documentation provided in the Draft Environmental Assessment (EA) is noted. Responses 1-2 through 1-7 address submitted comments on aircraft noise contours and airspace protection surfaces.

Response 1-2: The existing condition year for the Noise Exposure Maps (NEMs) update, prepared under Title 14, Code of Federal Regulations (CFR) Part 150, Noise Compatibility Planning, is 2010, which is the same as the analysis included in the Final EA for the proposed Runway Safety Area improvements. Consistent with 14 CFR § 150.21, the forecast year for the NEMs update would be 2016, which is at least 5 years from the date the update would be submitted late 2011/early 2012. The forecast year NEM under Part 150, is different than the future years analyzed in the Final EA, which include 2015 and 2020. However, the future year analysis for both the Final EA and the NEM update are based on the same 2010 Federal Aviation Administration (FAA)-approved aviation demand forecast. Further, the noise modeling effort using the FAA's Integrated Noise Model also includes the same aircraft substitutions to ensure consistency between the Part 150 NEM update and the Final EA.

Response 1-3: San Francisco International Airport (SFO or Airport) recommends that the City/County Association of Governments of San Mateo County (C/CAG) (the Airport Land Use Commission in San Mateo County) use the noise contours included in the Final EA for the Runway Safety Area program to update the current update of the comprehensive airport land use compatibility plan (CLUP) for the environs of SFO. At this time, SFO has not yet submitted its updated NEM's to the FAA pursuant to 14 CFR Part 150. SFO must first complete the NEM update and submit them to FAA for acceptance. Following FAA's acceptance of the updated NEM's, the C/CAG's CLUP could subsequently be updated in 2012 with the FAA-accepted NEMs. Since the proposed Runway Safety Area Program will not create an overall change to the numbers of aircraft using the airport, SFO does not anticipate any substantial differences between the 65 CNEL noise contours shown in the Final EA for the year 2015 and the location of the 65 CNEL noise contour in the updated future NEM for the year 2016 .

Response 1-4: As described in **Section 4.2** of this EA, the Proposed Action Alternative, compared to the No Action Alternative, would not result in off Airport changes to noise contours in the Daly City and South San Francisco area. The 65 CNEL noise contour is located within the cities of Daly City and South San Francisco. Changes to location of the 65 CNEL noise contour as a result of implementation of the Proposed Action Alternative contours are limited to a small area localized within a radius of approximately 2,000 feet southwest of Runways 1L and 1R (in the City of Millbrae). As shown in **Figures 4.2-1** and **4.2-3** the changes in noise contours that would occur in Daly City and South San Francisco area between 2015 and 2020 are a result of projected increases in aviation activity that SFO expects to occur with or without implementation of the Proposed Action Alternative.

Response 1-5: 14 Code of Federal Regulations Section 77.19, *Civil Airport Imaginary Surfaces,* defines transitional surfaces that "*extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces. Transitional surfaces for those portions of the precision approach surface*

which project through and beyond the limits of the conical surface, extend a distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline." Changes in the location of the 7:1 transition surface for the proposed RSA program compared to the No Action Alternative would be minor.

Any changes to the location of the transitional surfaces would be identified based on detailed design of the Proposed Action Alternative. This detailed design includes the precise size and location of the proposed Engineered Materials Arresting System installations within the RSAs and will provide the precise location of the end of the runway. This information is necessary in order to then identify the precise location of the various Part 77 Imaginary Surfaces. Figures 5-1 through 5-4 show the approximate location of the 7:1 transition surfaces.

Response 1-6: Detailed design of the Proposed RSA improvements would need to occur and new Standard Instrument Departure (SIDS) procedures and Standard Terminal Arrival Routes (STARs) would need to be designed by the FAA in order to analyze potential changes to airspace protection surfaces established in accordance with FAA Order 8260.3B, *United States Standard for Terminal Instrument Procedures (TERPS)*. Development of SIDS and STARs are Federal actions that must comply with the National Environmental Policy Act of 1969 (NEPA). Therefore, detailed design and analysis of the airspace protection surfaces cannot precede completion of environmental analysis under the NEPA by the FAA.

Response 1-7: At this time an analysis has not been conducted to identify natural or manmade objects that may penetrate through the approach surfaces under the Proposed Action Alternative that are presented in **Section 5.4** of this EA.

Response 1-8: Comment regarding the opportunity to review and comment on the Draft EA is noted. SFO staff will continue to coordinate and work closely with ALUC and surrounding cities on the proposed SFO RSA Program.

San Francisco International Airport
Runway Safety Area Program
Draft Environmental Assessment
Public Workshop and Public Hearing | July 28, 2011

Comment Card

PLEASE NOTE: Comments must be received no later than **5:00 p.m. PDT on Friday, July 29, 2011**.

You may submit your comments by one of the following:

1. Return this form to the collection box located at the Information Table at the Public Workshop and Hearing on July 28, 2011, 6:30 to 9:00 p.m.
2. Fax your comments to the fax number provided at the bottom of this form.
3. Mail your comments to the address provided at the bottom of this form.
4. Deliver your comments to: Audrey Park, Planning and Environmental Affairs, San Francisco International Airport, 710 N. McDonnell Road, 3rd floor, San Francisco, CA 94128.

Please Print

Name: FARHAD MORTAZAVI

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Phone: 249-2416

Email: Fmortazavi@ci.millbrae.ca.us

Organization (if any): CITY OF MILLBRAE

Comments:

THE ONE CONCERN FORWARDED BY MILLBRAE DPW'S DIRECTOR, RON POPP, IS THAT SINCE PART OF THE PROPOSED PROJECT IS TO COVER 600 FT. OF CULVERT (FIGURE 3.9-1 OF DEA), THE FUTURE MAINTENANCE OF THIS PART IS AN ISSUE. THE DIRECTOR INDICATES THAT IT MAY REQUIRE FOR HIS STAFF A SPECIAL TRAINING EFFORT AND ALSO NEW MAINTENANCE EQUIPMENT TO ADDRESS THIS CHANGE. 2-1

Continue on reverse, if necessary

Project Contact:
Audrey Park
San Francisco International Airport
Bureau of Planning and Environmental Affairs
P.O. Box 8097
San Francisco, CA 94128
Fax: (650) 821-5383

RESPONSE TO COMMENT 2

Response 2-1: The identification of training or additional equipment that may be required by the City of Millbrae for ongoing maintenance of the existing Millbrae Highline Canal is outside the scope of this EA. However, SFO staff will continue to coordinate with the City of Millbrae regarding these ongoing maintenance activities.

COMMENT 2

2-1